THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXIII. No. 2107.] LONDON, SEPTEMBER 29, 1903. [55TH YEAR. PRICE 6d.

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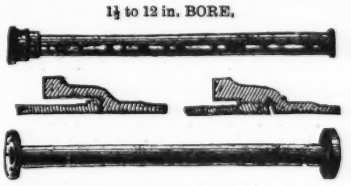

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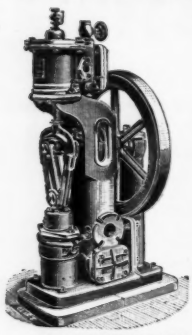

705. "SINGLE RAM" STEAM-PUMP.

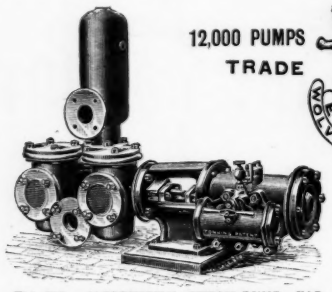

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

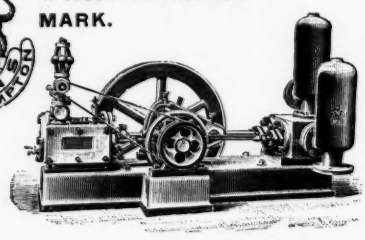

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

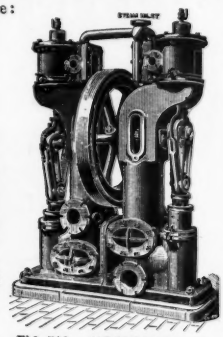

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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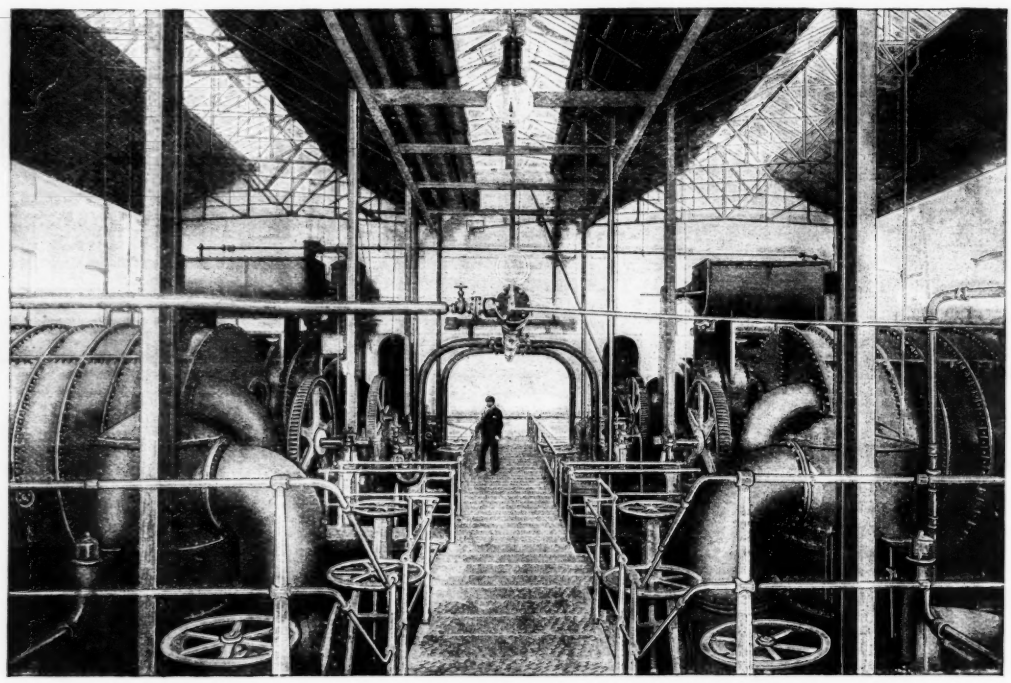

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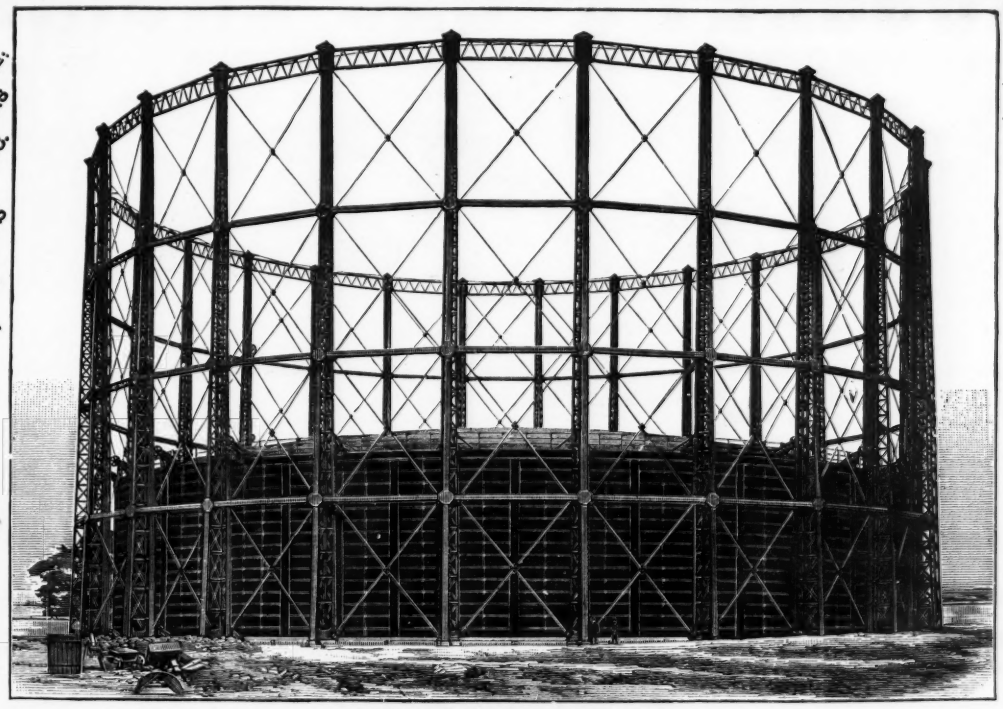

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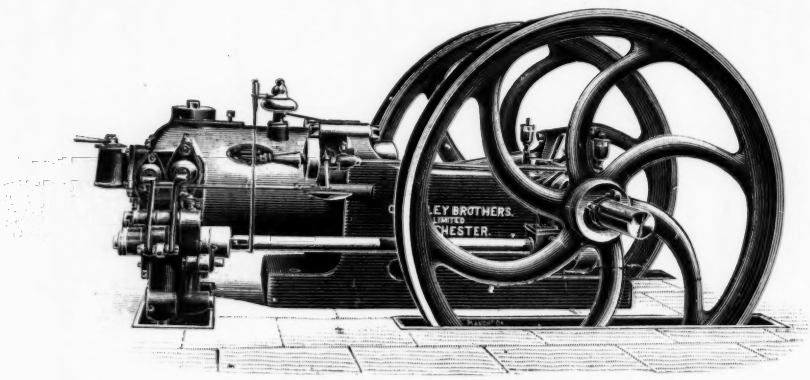

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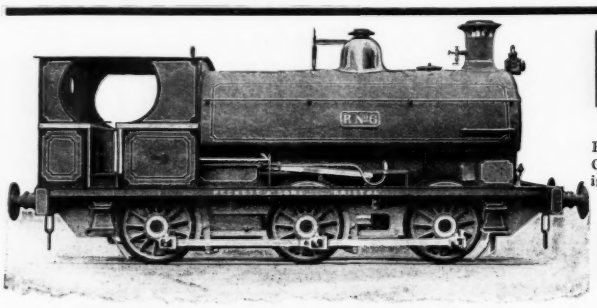

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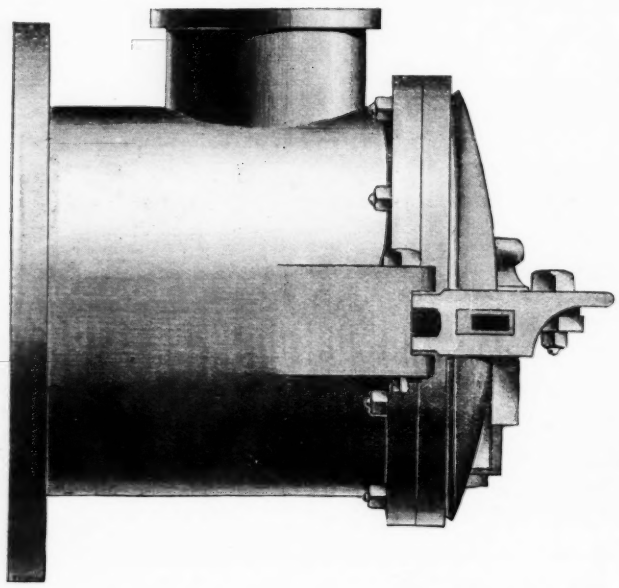

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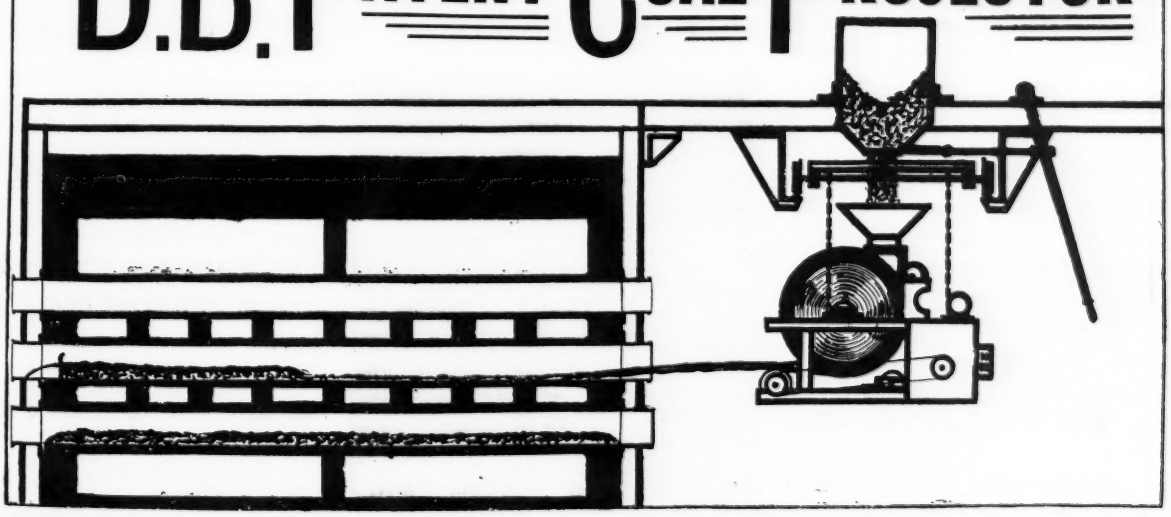

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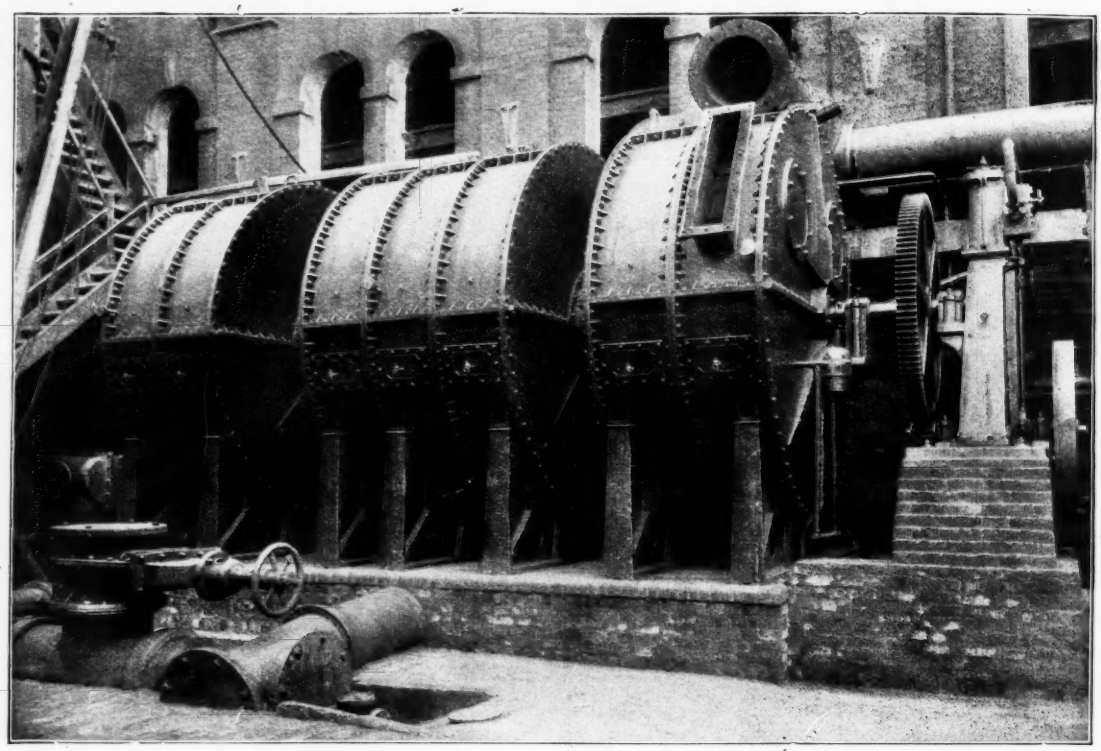

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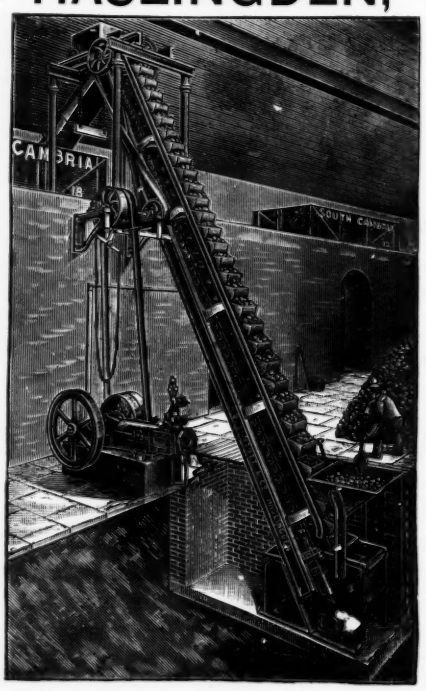

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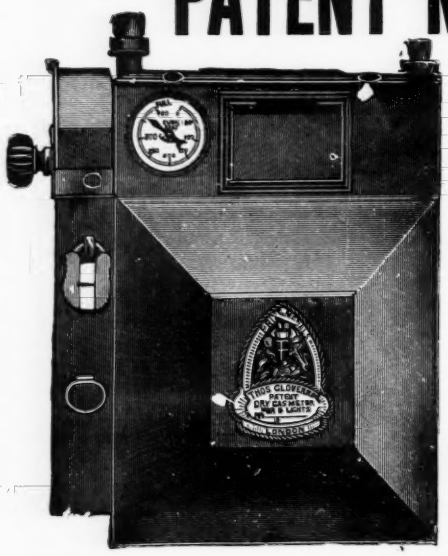

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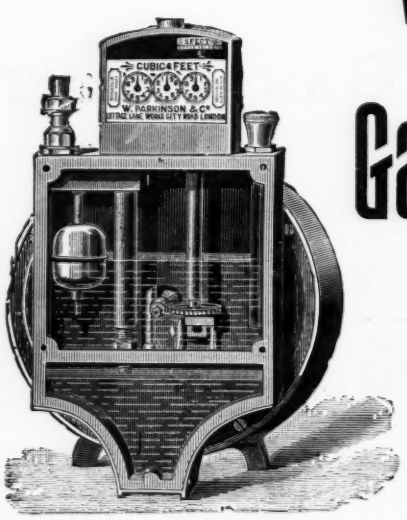

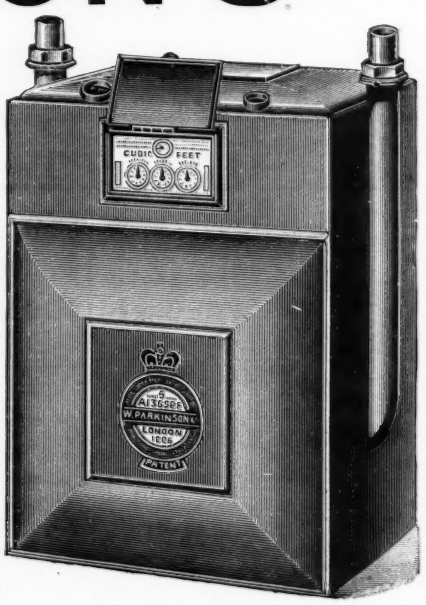

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXIII., No. 2107.—TUESDAY, SEPTEMBER 29, 1903.

EDITORIAL NOTES.

An Error, and an Explanation.

In the course of last week's "Editorial Note" on the "Cabinet Crisis," there was a reference to the conditions of the portland cement trade of the Medway, which is erroneous. It stated that Germany levies an import duty on this product of 10s. per ton; the fact being that there is no German tariff for portland cement. We regret the mistake, which did not originate with the "JOURNAL." The statement was made for election purposes at Rochester; and we repeated it in all good faith—never supposing that a mistake would be made in regard to a matter of such marked local interest, and so certain of swift correction if misrepresented. The correction was duly forthcoming the following day, but it did not reach us; so impossible is it to overtake an error that has once got a start in print. The greatest caution is necessary when reported facts and figures are to be repeated; for one never knows whether or not the reference, even if verified, is to be trusted. Still, life is too short for all the precautions that might be indicated as proper for securing flawless accuracy. Besides, the reader of reports open to investigation has his own responsibility to discharge. He is not bound to believe every statement he reads. Indeed, his duty is rather on the other side, and lies in the obligation to test evidence in the ordinary way before using it as a basis for any judgment. In the case in point, this is precisely what happened. The statement was noticed, inquired into, and proved to be unfounded; and the truth of the matter was then most kindly communicated to us for the benefit of all those readers (and we trust they are many) who study our comments with equal care.

Curiously enough, however, the error which we were led to propagate in this way is about to be converted into truth. Though Germany does not yet levy an import duty upon portland cement, it is going to do so, after the rate of 6d. per 100 kilos.—which is just one-half of the figure thus rather prematurely than wrongly reported. Nor is this all. From whatsoever cause or causes it has arisen, it is the fact that the exports of cement from this country have fallen from £1,282,000 in 1890 to £521,000 last year. No wonder the cement manufacturers of the Thames and the Medway cannot take all the gas coke they might be able to obtain from Beckton and the other gas-works on the London river. The figures were noticed by the "Pall Mall Gazette," which inquired: "If three-fifths of our foreign trade in this commodity has disappeared in twelve years, how many decades of continued Cobdenism will suffice to swallow up the remainder?" The cement makers and the bargemen of Rochester are under no misapprehension as to what ought to be done in the circumstances. If Germany has not yet protected the native cement trade against the United Kingdom, America has long done so to about 73 per cent. on the value—judging from the analogy of other commodities mentioned in the Board of Trade tables. The working population of Rochester and the vicinity are in a good position for testing the tendencies of the home and foreign trade, for many of them are employed in or about the barging traffic which is so conspicuous a feature of the Thames and Medway. The owners of the great red-sailed barges know where the goods come from, and whither they are despatched. The men who gain their livelihood in this traffic also perceive how fast the German North Sea ports have grown these last few years; and they seem to think it about time to inquire as to the why and the wherefore of these things. Twelve years ago, France took £14,269 worth of our cement; last year only £854 worth went the same way. The Russian trade was even worse—£15,754 falling to £303. The United States is far and away the most unsatisfactory case, the trade in cement having fallen, by reason of the tariff and nothing else, from £484,861 to £31,811. If the example were singular, it would be less serious; but the same process has been going on in almost everything exported by this country, with the exception of coal and "printed books." It is odd that commodities at the opposite poles of classification should exhibit the common character of being in increasing demand.

Concerning the Keeping of Coal; and Some Other Things.

The pressure of conventional ideas and of use and wont in regard to ways of doing things, is really tremendous. The observer who declared that there is nothing new under the sun was justified in his conclusion; but he left his striking statement unexplained. The reason for the condition of things to the existence of which he testified, either did not enter into the scope of his philosophy, or he omitted to mention it. Not until the great seer of the Nineteenth Century, Charles Darwin, perceived the method by which Nature works, was it possible to supply this omission. Nature now stands revealed to us as a most inveterate, and, on the whole, successful adapter and economical worker-up of old material over and over again, but as being extremely sparing of new departures. Not only is it absolutely true of Nature that the thing which has been is the thing which shall be—for there is no matter in the Cosmos that is either destroyed or added to—but the old moulds are used with most ingenious modification of effect, if this is necessary; and rather than break out into a new invention, Nature will allow whole types to be extinguished. So that one might truly characterize Nature as conventional to the last degree, persisting in her accustomed ways to the crack of doom. And man, being part of the natural scheme of phenomena, is essentially a conventional agent. Whenever he fondly imagines himself to be most untrammelled by customary and fashionable shackles upon the freedom of his individual spirit, then he most surely demonstrates the truth of the humorist's observation that "there's nothing original in "him, excepting original sin."

We can observe the operation of this instinctive conventionalism in all human inventions, from the prehistoric pottery ornamented with designs reminiscent of the older basket-work, to the electric omnibus in respect to which the lack of the usual horse is the most salient novelty of design, or the sham candles of the artistic adapter of the electric light to highly decorated interiors. It is well known that the standard railway gauge of the United Kingdom was a mere copy, as a matter of course, of that of the North of England colliery tramways; and the passenger carriages are still technically styled "coaches." A very curious effect of this complete natural absence of originality from the workings of the human spirit, even when addressed to solving the new problems presented from time to time by advancing civilization, is this—that all sorts of ways and practices are followed unquestioningly. It is with the greatest difficulty that people can be brought to reconsider the customs and habits of thought which they have always grown up to and have taken for granted. We always have with us, it is true, besides the rich and the poor, a goodly number of persons who profess originality and independence of thought, and "advanced" opinions; but there is nothing in such professions. The man of science may be pontifically minded; just as the Progressive is certain to jib against progress in ways uncongenial to his prejudices. Whose was the truly original mind that first called in question the "coddling" system of treating delicate lungs? That is a kind of invention which must always be extremely rare. There has grown up a fashion of restricting the category of inventions to mechanical or physical applications; so that the general public think of an inventor as an ingenious person with a talent for doing new things with wheels and springs. There is just as much invention in many intangible phenomena of modern social life, and in improved industrial and trade dispositions.

A remarkable illustration of the force of custom occurs in the storing of coal. The subject is one that comes within the borderland that separates the purely mechanical

field of invention from the region of speculation concerning cosmical phenomena. Hitherto coal, as a matter of course, has been kept in the dry, for all purposes. It was known to deteriorate by keeping, whether for gas making or as steam fuel; and unless care was observed, it would even take fire of its own accord, and so quickly destroy itself. Yet nobody thought of reversing the treatment, and wetting coal to preserve it. When Mr. Tysoe, of East Greenwich, tried the experiment of dealing with spontaneously ignited coal like any other conflagration, by turning the hose-pipe upon it, the idea seemed contrary to all traditions. The coincidence of wet coal being bad for carbonizing doubtless had the other effect of unconsciously removing from the range of every gas manager's thoughts the notion of deliberately wetting it. Be this as it may, the report that the British Admiralty were instituting experiments on the storing of steam coal under water, struck most people accustomed to the handling of coal as strange. Lately the finish was put to this suggestion by a communication from Mr. John Macaulay, the General Manager of the Alexandra Docks and Railway, Newport (Mon.), made to "The Times," which, as already briefly mentioned in the "JOURNAL," appears to settle the question in favour of the wet storage of coal. According to Mr. Macaulay, dropped coal dredged from the docks, after lying for months under water, burns as well as fresh coal. Going further into the matter, he had an experimental quantity of coal placed under sea water for two months. Calorific tests of the coal before and after immersion, made upon samples taken from the same block of a typical specimen of Monmouthshire steam coal, showed only about 0·8 per cent. loss. Mr. Macaulay's first statement in this regard was published a year ago, and was the cause of the action of the Admiralty in the matter. Recently he has written again; this time dealing with the comparison between fresh coal and samples recovered by dredging from the Bristol Channel, after having been in the water for so long that the lumps were rounded like boulders, and some portions covered with barnacles. Other samples had lain in particular corners of the docks for at least ten years. In testing by actual steam raising and otherwise, the dredged-up coal came out the best. The coal in boulders from the Bristol Channel was 4 per cent. better than the best fresh coal procurable, mined within the week. On the other hand, some coal that had been under water for three years showed a loss of less than 2 per cent. This is very remarkable. The actual proportion of loss sustained by gas or steam coals through storing or weathering is not precisely known. It probably varies considerably, according to the kind of coal; but an estimate puts it at about 10 or 12 per cent. for twelve months in England, and at least 20 per cent. abroad. The immediate effect of Mr. Macaulay's relation will probably be that gas and railway engineers with stored coal will try copiously wetting it, to see what are the results. Gas coal kept out in the open this year has not suffered from dryness or heat; but, after what we have heard, the liberal play of a hose-pipe on the heaps once a week should be a paying proceeding.

If further experience confirms Mr. Macaulay's discovery, and gas and steam coals everywhere are stored wet until wanted, how striking an example will be thus afforded of the power of conventionality even in matters of this order! That it should be left to the present Year of Grace for somebody to find out the best way of keeping coal without any deterioration, and that this way should be so ridiculously simple and easy, amounts to a strong reflection on the power of the human intelligence in face of natural phenomena. It seems scarcely conceivable that nobody ever thought of this expedient before, or even went to the trouble of testing some drowned coal to see what had happened to it. If such a conclusion is forced upon one by the evidence, our estimation of the quality of human cleverness and the conquests of modern science, though, perhaps, a little kinder than Carlyle's, must be considerably humbled from the conventional standard of the newspaper and lecture platform.

The Condition of the Petro'eum Trade.

A GOOD deal of uncertainty appears to prevail at the present time with regard to the petroleum trade. The various oil companies whose headquarters are in England complain of very bad times; the Chairman of one concern which held its annual general meeting recently stating that low freights for steamers have unfortunately coincided with low petroleum values. Besides this, the production of many of the fields, both in America and in Russia, has declined. Disturbing rumours have been put in circulation concerning one of the largest and best advertised lines of tank steamers; and it seems to be agreed that most of the money poured into the Texas field is lost beyond recovery. On the other hand, a new "strike" has been made in this region; and at a place called Sour Lake there has been a rush of some 10,000 miners in two months. It cannot be considered that the current idea regarding the superiority of American commercial and industrial methods has been borne out by the history of the Beaumont (Texas) oilfield. Here the derricks were planted so thickly, while there was any oil going, that they left no space between them. Every boring was made the basis of an enormously over-capitalized speculation; and now acres of the district are deserted, and the outfits are in some instances being pulled up for carting off to Sour Lake, which is credited with a daily production of from 50,000 to 100,000 barrels. If the field had been properly controlled, and only so much oil raised as could be profitably disposed of, the investment would have lasted for years, to the better advantage of all concerned. Now much of it has been got rid of for next to nothing; and wasteful exhaustion of neighbouring deposits is in progress.

How is it that the famous "Trust" system, of which one hears so much, has not come into operation here? As regards the Russian production, the Chairman of one of the English Companies, already referred to, has told the shareholders that the efforts incessantly made during the past year to improve the value of crude petroleum and its products had been fruitless. There had been many attempts at combination between producers, refiners, and exporters; but they had all led to the same negative result. Business has been bad all round. Bankruptcies and strikes made matters worse; and as the latter were frequently attended with incendiary fires, the condition of the industry could hardly have been worse. By the end of next year the pipeline from Baku to Batoum will be completed, and this may have the effect of revolutionizing the oil trade of the whole world. Altogether, therefore, it is not at all likely that the price of any kind of petroleum derivative will rise much higher than the current figures, even if the new American fields should prove as temporary as Beaumont.

The Beauty of the Gasholder.

CONCERNING matters of taste, as men were warned by an ancient author who is still quoted, there should be no argument—which is not to say that this class of subjects may not be talked about. Indeed, differences of taste between men of the same nationality and breeding very often come up for discussion; while there is no more interesting topic than the changes of taste which have distinguished successive periods of a country's history. On the whole, and notwithstanding a number of discouraging symptoms, it is possible to believe that the course of public taste is an improving one. It is true that many examples of very bad taste continually crop up; so that the judicious are left wondering whether, for instance, it has been quite worth while to teach the populace to read and write, seeing the use that is too often made of these attainments. Yet it must be remembered that in a modern community many different grades of culture exist together; and they have to be catered for according to their degrees. The point is that the best of contemporaneous culture is far better than anything that preceded it. Of the truth of this judgment there can happily be little doubt. Good taste is much simpler and less finicky than the tone of much comparatively recent culture. It is also bolder, and more catholic.

A very astonishing observation was made not a great many days since by a drawing master to his pupils, which one might venture to say would have been impossible even thirty years ago. The master was actually extolling the beauty of big gasholders in a town landscape, and pointing to the "magnificent curves" which these structures present in perspective. He declared that there is nothing finer, in the actual display of form; and he seemed disposed to insist on the existence of the power of seeing this element of beauty in things which have always been abused for ugliness, as a test of the possession of the feeling for Art. To the remark of a more than slightly amazed hearer, that he had always considered gasholders ugly, the master replied that this is so, if prettiness is held to be the ideal. But it is no longer a question, for the inhabitants of the work-a-day world, of the

prettiness of the "purling brook," and of Watteau scenes which never existed. We have to live with gasholders, and many of us in the shadow of big mills and flaring manufactories. What then? Must we consent to forego the sentiment of the beautiful, and permit the love of the unutilitarian aspect of the world we live in to die out for lack of nourishment? Not at all. The seeing eye will still distinguish beauty in what to the unseeing is sheer ugliness. It is a great saying, that a thing need not be pretty to have a beauty of its own; and if some of the quality in question really resides in the eye that sees as well as in the object seen, so much the better for the owner of the eye, for he will always have his pleasure within him, which cannot be taken away. It is better to be able to perceive the beauty of a gasholder, or the picturesque side of retort-stoking, than to need the services of a "man from Cook's" to point out show-places to be duly admired because the opportunity for doing so in the regular form has been paid for.

The Institution of Gas Engineers and the Palace Exhibition.

On Wednesday the Council of the Institution of Gas Engineers had a meeting, at which Mr. G. Collins Levey, C.M.G., the Exhibitions Organizing Commissioner of the Crystal Palace Company was present, in order to confer with the President (Mr. H. E. Jones) and the members on the subject of the proposed Gas and Smoke Abatement Exhibition at the Palace during the Christmas season—from Dec. 15 to Jan. 16. The outcome of the discussion shows that the Council are fully satisfied with the arrangements the Crystal Palace Company are making, as they consented not only to extend their patronage to the exhibition, but to countenance and lend their influence in consummating the scheme projected by the Organizing Commissioner. Their only reservation, we believe, is that the questions of the allotment of space, the appointment of competent jurors, and the bestowal of awards must be left entirely in the hands of the Crystal Palace Company. If this is so, the decision is a wise one. But the organizing of the Exhibition is a matter in which they can concern themselves; and they will co-operate in every way with the Commissioner in bringing to the Palace a representative collection of gas apparatus and appliances or models such as will interest not only the public, but the gas engineering profession and the administrators of the industry generally, and so not only wipe out the degrading effect of former insufficient representation of the industry, its power, and its accomplishments, but bring together a display which shall be educative in every department. Now that the Council of the Institution are convinced as to the *bona fides* of the promoters, and have agreed to co-operate with them, it will rest with suppliers of gas-works material and manufacturers in all branches to do their part in bringing about the unprecedented success which the industry they serve will, under the circumstances, desire.

The Scope of the Exhibition.

We have been favoured with an early copy of the Exhibition prospectus, which is to be immediately issued. The grouping of the exhibits delineates an ambitious scheme, but, ambitious though it is, it is one which the manufacturers can, if they so will, cause to be an actuality. There are about a dozen sections, comprehending coal and other material, through the stages of apparatus and appliances for gas production, distribution, lighting, heating, and cooking, to the industrial uses of gas. In the manufacturing section, it is observed that an effort is going to be made to include examples or models of the new retort-house plant which has lately attracted so much attention—such as vertical retorts, and the new charging and discharging machines. In the other departments, the exhibits invited need not be enumerated; but the Palace Company, it is clear, are prepared to afford adequate accommodation for everything that their Commissioner may be advised is worthy of a place. There is one paragraph in the prospectus which is attractively suggestive. It says: "In the Press, the statement is made that a vast amount of ignorance exists in the public mind on the question of gas lighting and heating. The opportunity is offered for making a strong attempt to remove that ignorance, and to educate the public in the methods of gas production and purification, distribution, and its varied uses. Provision might also be made by gas companies to show what can be accomplished, by means of the incandescent burner, with gas of lower candle power and cheaper in price than that which has hitherto been supplied." The Crystal Palace is in the Crystal Palace District Gas Company's area, and not far removed from that of the South Metropolitan Company. The former Company are desirous of obtaining parliamentary sanction to supply 13-candle gas; and the latter Company, it may be conjectured, would not be averse to dropping another candle. Then why should they not jointly undertake this demonstration? It might do more good than many hundreds of pounds spent in debating the question in the Committee rooms. If the idea commends itself, Mr. Carpenter and Mr. Shoubridge would no doubt quickly find means—if eleven weeks would be sufficient for erecting an experimental plant—for showing the public how gas is produced, and how efficient and economical a lighting and heating agent gas of 13-candle power would be. There would be a good demand for the gas by the exhibitors. However, about the exhibition as a whole, the prospectus sets forth all details in a clear, straightforward manner, without any flowery embroidery such as is sometimes met with in similar documents. We need not enter into it at greater length, as all interested can obtain copies from the Palace Company's Exhibition Offices, 20, Victoria Street.

An Extraordinary Electric Lighting Scheme.

The story of one of the most singular electric lighting schemes it has ever fallen to our lot to tell appears in the "Miscellaneous News" columns under the heading of "The Folly of the Felixstowe District Councillors." Many strange doings in connection with electric lighting undertakings have been dealt with in the past; but this is about the strangest. There is a precedent for the scheme in part at Beckenham; but there the undertaking was a new one. Here the Council propose to purchase, at an outrageous price, an unauthorized undertaking, with only a small business, and the encumbrances of an overhead wire system, and a big expenditure of capital in prospect; to find all future capital; and to allow the Company to carry on the business for a number of years. In return, the Council are to receive an interest on the money which will not completely cover—even if it can be earned, and that is doubtful—interest and repayment of the loan. This is, indeed, municipalization extraordinary; and all well-wishers of the town will sincerely hope the Local Government Board will not countenance such a madcap scheme. It is a pity that there is not some machinery available for immediately removing from office a local authority who show such a lamentable want of business ability as to seriously father such a project. If the ratepayers do not depose them as opportunity offers, it will be surprising; but, if the scheme is carried through, retribution in another distasteful form will certainly overtake them.

Municipalities and Depreciation—A Suggestion.

Those who were present at the meeting of the Society of Engineers towards the close of last year at which Mr. C. H. W. Biggs read a paper on the subject of Municipalities and Depreciation Funds, or who read the notice of the proceedings that appeared in the "JOURNAL," will remember the very strong attitude taken up by Mr. H. Sherley-Price in opposition to the view expressed by the author that the insistence upon depreciation as well as efficient maintenance and repayment of loans in regard to corporation concerns was absurd. Mr. Sherley-Price is convinced of the absolute need of municipal bodies making provision for the depreciation of their plant; and, as will be seen from the report of the third day's evidence before the Joint Committee on Municipal Trading, which appears in another part of the present issue, he was afforded an opportunity of placing his opinions before this body. The greatest danger to be guarded against by corporations is the rendering of existing plant obsolete by the introduction of more efficient and more economical methods of working, &c.; and this danger, of course, applies more particularly to electrical machinery, which is in a comparatively early stage of development, and so is constantly being improved upon. Mr. Sherley-Price, however, went beyond pointing out the need for such a depreciation allowance; he made a suggestion with regard to the manner in which the rate should be fixed. It must vary in different cases, and from time to time in the same case; and therefore his idea is that the proper figure can only be arrived at by means of a periodical valuation of the plant concerned by an expert valuer. Mr. Sherley-

Price suggested that this should be done by a Government official, as it would be absolutely necessary that the person employed should be perfectly independent of local influences. As already remarked, electric lighting and traction are the two branches of municipal enterprise which chiefly render advisable the adoption of some such system as is here outlined. Waterworks admittedly need very little attention, as the depreciation in their value can in any event be only slight; and Mr. Sherley-Price was good enough to say also that his proposed plan did not apply so much to gas-works "as to modern undertakings." That is true. The life of gas-works plant is by this time pretty well known; but the same cannot be said of the material used for electrical purposes. And then there is the all-important question of new inventions to consider. Heaps of electrical machinery has already had to be discarded, not because it was worn out, but because the improvements brought about by more perfect knowledge had rendered it out of date. How much more of this kind of plant will have to go the same way, cannot at the present time even be guessed at. It is impossible to see more than a very short distance ahead; and hence the inadequacy of a fixed rate of depreciation to meet the demands of the case. Mr. Sherley-Price's idea is that it would not cost very much more than £10,000 a year to value at stated periods the municipal electricity undertakings in England on the lines he suggests; and seeing the magnitude of the interests at stake, this could not be considered an unreasonably large amount to pay for the satisfaction of knowing that proper attention was being given to the pressing question of depreciation.

Battersea's Progress.

At the same sitting of the Committee, another witness threw a considerable amount of light upon local government affairs at Battersea, where Progressivism is rampant. One cannot help feeling sorry for the working-class inhabitants of this very much-tried place, though their apathy at election times is doubtless the cause of the greater part of their troubles. The local indebtedness is, of course, under the prevailing condition of things, going up by leaps and bounds; and as a necessary consequence, the rates are doing likewise. The particulars given with regard to the electric light installation largely explain the recent decision of the Council to wire for electricity the buildings erected under their housing scheme, and to make no provision whatever for the supply of gas. The electric light undertaking is certainly in desperate need of some further customers; and therefore means have been taken of finding them. If only the tenants will use enough current (and are able to pay for it), they may be the means of relieving the citizens generally of a penny rate—which is the price they are at present paying for the privilege of seeing a handful of the private residents and some of the larger shopkeepers lighting their premises by means of the "new illuminant," and for the doubtful luxury of a few electric lamps in the main thoroughfares. This lighting concern is, however, only one of Battersea's troubles; there are several other outlets for extravagance, which would seem to have been taken full advantage of. Altogether, the annual interest and capital repayments on the loans is alone equal to a 10d. rate; and owing to the great facilities possessed by the Metropolitan boroughs for obtaining money, it would be ridiculous to expect that the borrowing will stop even here. The London County Council are the lending authority; and the circumstances of the transaction are such that they have no interest in curbing the impetuosity of the borrowers—rather the other way, in fact. Thus we see loans granted for purposes which it would be very much better to meet out of revenue; three such instances at Battersea being the whitewashing of the Town Hall, the purchasing of horses for sanitary purposes, and the provision of furniture for the Town Hall. Then, of course, there is a Works Department, so that none of the work of the borough is made the subject of competitive tendering; and what the result of this is likely to be, it is easy to foresee. At the best, it furnishes but little incentive to the economical administration of public affairs. It can readily be understood that the large body of workmen thus employed—there are, it is said, about 1000 of them, each of whom "is a small election agent himself"—constitute an influence to be reckoned with at voting times; but the ratepayers who get no "pickings" out of the prevailing state of affairs should see that a radical alteration is made in the policy of the Council. The present rate of progress at Battersea is far too rapid to be healthy for those who have to supply the motive power.

An Early Appreciator of Gas-Lamps.

Quite in the early days of gas lighting, it was recognized that there were uses to which the public lamps could well be put besides the all-important one of guiding the footsteps of those who had to be abroad by night. So long ago as Sept. 5, 1815, a letter was addressed to the Editor of "The Globe," in which the writer begged to be allowed to suggest, through the medium of that journal, that it would be a great improvement if, in the gas-lamp nearest the corner of each street, the name of the street were painted; and also that, on the lamp nearest the water-plug, the situation of it should be indicated, as well as the place at which "fire-ladders" could be obtained. In this way, the writer remarked, "great convenience at night would be ensured to strangers who do not know the streets; and, in the event of fire, the means of extinguishing it would be promoted." Nearly ninety years have elapsed since the penning of this letter; but apparently the idea put forward has not even yet entered the heads of many of our local governing authorities. Though there might be difficulty in affixing to some lamps all the information suggested by this correspondent, many travellers on lonely roads would be pleased to find (in a position where they could see it) some intimation of the direction in which they were going. But perhaps the general adoption of such an improvement as this is altogether too much to expect, when one calls to mind the fact that even now a not at all uncommon sight is a signpost painted on one side of the arm only, so that a stranger who approaches it from the other side is faced by a blank.

London Statistics.

The annual volume of statistics relating to the Metropolitan area, just issued by the London County Council, contains many imposing figures. The population of the Administrative County of London is given as 4½ millions, and of Greater London, which includes the areas of the City and Metropolitan Police, and contains all parishes within 15 miles of Charing Cross, as upwards of 6½ millions. This is an enormous aggregation of people to be supplied with gas. The population continues to increase, more especially in the suburban ring which is served by the extra-Metropolitan Gas Companies; but the rate of increase is slowing down, compared with decades previous to the last. Indeed, the present rate of growth of London is the smallest on record—a circumstance which there is no apparent reason to deplore. There should be plenty of trade to be done by the London and Suburban Gas Companies for many years to come in making the advantages of gas available as fully as possible for this enormous population, the daily provisioning of whom must be regarded as one of the wonders of the world.

Mr. W. R. Herring and the Glasgow Appointment.—Rumour has been busy lately linking Mr. W. R. Herring's name with an application for the appointment of Chief Engineer and General Manager to the Glasgow Corporation Gas Department. In view of this, the proceedings at the meeting of the Edinburgh and Leith Gas Commissioners yesterday will have especial interest in professional circles. A recommendation was made by the Works Committee that, in recognition of the services of Mr. Herring in connection with the Granton works, his salary be increased to £1500 a year, on condition that he would undertake to remain Engineer to the Commissioners for at least a period of five years. Non-approval of the proposal was moved by Bailie M'Kelvie, of Leith, who asserted that the increase of £300 was proposed to keep Mr. Herring from going to Glasgow. Whatever the reason, the fact that the recommendation was agreed to by the Commissioners by no less than 14 votes to 4 is a substantial mark of the confidence they have in their Engineer; and upon this Mr. Herring has our heartiest congratulations.

Electric Lighting in Islington.—The members of the Society of Engineers, accompanied by their President (Mr. J. Patten Barber), last Wednesday visited the electricity generating station of the Islington Borough Council. The works are situated in Eden Grove, Holloway; and the current is distributed on the high-tension alternating system, with street tank transformers as sub-stations. For street arc lighting there are five 30-light and three 50-light rectifiers, with two boards (one of the 1895 and one of the 1902 pattern by Ferranti), and five alternating series, constant current transformers. The street lighting now consists of 473 lamps. For side-street lighting, experiments have been made with two different kinds of glow lamps and Nernst fittings.

WATER AFFAIRS.

Typhoid Fever and the Belfast Water Supply.

THE publication of the report presented to the Health Committee of the Belfast Corporation by Professor J. Lorrain Smith, M.D., on the subject of the prevalence of typhoid fever in the city (to which reference was made last week), naturally excited considerable interest, not to say alarm. An attempt was made by a Press representative to elicit from members of the Water Board their views upon the report; but, with one exception, they declined to commit themselves to any very definite statements to controvert the condemnatory assertions of the author in regard to the water supply. It was thought to be better that his conclusions should be combated in a systematic way, and the results submitted to the public in concrete form, rather than through the medium of the irrepressible "interviewer." Everybody will acknowledge the wisdom of this course. Each member of the Board is, no doubt, individually very closely concerned with the question at issue; but the reply to the attack upon them as a body should he made collectively, and by means of an official document. Meanwhile, the Chairman of the Board—Mr. A. P. Dalzell—deemed it advisable to offer, at their meeting on Friday, a few observations upon the portion referring specially to the water supply. He did not hesitate to express the opinion that Dr. Lorrain Smith had approached his investigation with his mind already made up as to the water being the main cause of typhoid fever in Belfast, and had excluded from consideration such facts as would not support his foregone conclusions.

Without going quite so far as Mr. Dalzell, we cannot help thinking that the Professor concentrated his attention too closely upon the water supply as the cause of the mortality from typhoid fever. His great point was that the introduction of the Stoneyford water in 1888 was followed by an increase in the typhoid death-rate; and the inference he drew was that the one must have been the consequence of the other. But, unfortunately for him, the facts do not, according to Mr. Dalzell, justify the conclusion, inasmuch as the water in question was not supplied for consumption until May, 1890. Therefore it could no more have contaminated the supply two years previously than the lamb in the fable could have fouled the water that was being drunk by the wolf. How, then, could the increase in the number of cases of the disease be accounted for? Possibly by the circumstance that about that time there was a general outbreak all over Europe, and that Belfast felt some of the effects quite independently of the water supply. Further points which do not appear to have had due consideration from Dr. Lorrain Smith are the inclusion within the city of certain insanitary areas which were regarded as dangerous, and the introduction of the Infectious Diseases Notification Act, which brought to light a number of cases which would never otherwise have been heard of. Surely, these are matters deserving attention in connection with an investigation such as the one under consideration.

A curious feature of this typhoid fever trouble in Belfast was pointed out by Mr. Dalzell as having been ignored by Dr. Lorrain Smith—viz., that while the Stoneyford water is used in several districts, it is only in one that the cases of the disease are above the average. No attempt is made to explain this. In one village supplied from the Stoneyford mains, typhoid fever has not been more prevalent than it was before the introduction of the water; and where it has attacked anybody, it has been traced to other causes, such as insanitary conditions and infected milk. Dr. Lorrain Smith could not but acknowledge that the former are only too common in Belfast. When we read of defective house drainage, of buildings being erected on ground made up with refuse from ashpits and cesspits, and the existence of 10,000 dwellings having these receptacles within a short distance of the back windows and doors, we do not see how he could do otherwise. But he does not seem to have attached to them the importance they deserve in the particular connection with which we are dealing. While suggesting that this state of things should be remedied, he does not point to it specifically as the possible cause of the prevalence—or even, so far as we are able to gather, as a potent factor in the propagation—of the disease. It is the water that, according to him, is chiefly at fault; and yet he says that he has never been able to isolate a single typhoid bacillus in it, though he appears to have been for years searching for the creature. He does not consider the milk supply responsible. But, curiously enough, in the case of a visitation which affected eight workmen's houses in a row of twelve, investigation revealed the fact that the occupants of the eight obtained their supply of milk from a particular dairy, while the others were supplied from a different source, and escaped infection. In this connection, reference may be made to a circumstance cited by Mr. Dalzell. While several cases of typhoid fever existed in a farmhouse in the Stoneyford catchment area, and while every possible precaution was being taken by the Water Board to prevent the pollution of the water supply, the milk and butter from this farmstead were being sold in the very district of Belfast in which typhoid fever has been most prevalent. This matter is not referred to by Dr. Lorrain Smith in his report, though he admits that milk forms a much more effective carrier of typhoid germs than water.

As was stated last week, we quite agree with the protection of the sources of water supply in every possible way. But whatever additional efforts the Water Board may make in this direction will be of little avail so long as insanitary conditions, such as those above referred to, are allowed to remain unaltered. It is to these, far more than to contaminated water, that, in our opinion, the prevalence of typhoid fever in Belfast is really due; and therefore it is the Public Health Committee rather than the Water Commissioners who should be called upon to take the necessary steps to ensure its abatement. Dr. Lorrain Smith, in the first of the recommendations accompanying his report, enjoins increased effort on the part of the public health authorities in order to remove the sanitary defects existing in a large proportion of the houses, and especially to control surface pollution. Leaky drains and old and defective ashpits and cesspools should be abolished, and defective sewers repaired or reconstructed. Finally, uncleanliness in the houses and insanitary habits of the occupants should be restrained by every available means; and the sanitary officers should, he says, have some effective way of enforcing measures for this purpose. Here, then, is a large field for the operations of the Public Health Committee. Let them work vigorously in it for a few years, and carry out the other recommendations affecting them in the report, and we venture to think they will do far more to bring about a reduction in the mortality from typhoid fever in Belfast than will be accomplished by any additional vigilance the Water Board may exercise in protecting their catchment areas from contamination.

Proposed Memorial to Watt.—A movement is in progress for erecting a memorial of James Watt, and it has been decided that the form it should take should be an institution for scientific research. An appeal is now being made for funds to carry out the project. Mr. Carnegie, who is the Secretary for America, has promised a subscription of £10,000 towards the object.

Reeson's Complete Gas and Water Acts.—In justification of the high opinion of Mr. Reeson's book (as a comprehensive, trustworthy, and handy work of reference on the subject of gas and water legislation) which was expressed when reviewing it in the "JOURNAL," it may be stated that it was included in the collection of the "Best Books of 1902" made by the Library Association, and exhibited at Leeds early this month in connection with their annual meeting.

The Production of Coke in the United States in 1902 was 25,401,730 short tons, compared with 21,795,883 short tons in 1901. The unprecedented production of coke in 1902 was accompanied by an increase in value, which was even more worthy of note. The average price per ton at the ovens was the highest recorded in a period of 23 years; and the total value reached the high figure of £12,667,833—an increase over the preceding year of 42·5 per cent. The value of the coal used in the manufacture of coke in 1902 exceeded that of 1901 by £1,584,512.

The Late Duke of Richmond.—The Duke of Richmond and Gordon, who died on Sunday morning, at the advanced age of 85, will be best remembered by some of our readers for his connection with the London Water Question. In 1866, a Royal Commission was appointed for the purpose of ascertaining "what supply of unpolluted and wholesome water can be obtained by collecting and storing water in the high grounds of England and Wales, either by the aid of natural lakes or by artificial reservoirs at a sufficient elevation for the supply of the large towns." The warrant constituting the Commission was revoked in the next year, and it was reconstituted by a new warrant in the previous terms, but with the further instruction that they were to "inquire into the water supply to the Metropolis," and ascertain "whether there are other districts in addition to the high districts of England and Wales from which a good supply of unpolluted and wholesome water can be obtained." The Chairman of the Commission was the Duke who has just passed away.

ESSAYS AND REVIEWS.

GAS ACTS FOR 1903.

(*Continued from p. 729.*)

THE Bournemouth Gas and Water Act gives the Company additional land powers, with permission to take lands belonging to the Poole Corporation on long lease. New quay works at Poole are authorized for the enlargement of the gas-works, to be completed within five years. The capital of the Company is also increased by £100,000.

The British Gaslight Company's (Norwich) Act empowers the Company to expend a further capital sum of £140,000 upon their Norwich Station, whereof £105,000 may be capital stock bearing 5 per cent. interest; and the remaining £35,000 (which is to be expended first) is to be borrowed money, raised on the best terms obtainable at the time. Back-dividend payments are limited to five years, provided the Company retain the right to make up at any time deficiencies which have occurred prior to Jan. 1, 1903. The sum of £1200 per annum, to include Directors' fees, is chargeable to Norwich for head office expenses.

The Broadstairs Gas Act authorizes the acquisition of new gas lands within three years. Gas is not to be manufactured on the existing site after twenty years, except with the consent of the District Council. Additional capital to the amount of £60,000 is sanctioned, not more than £20,000 being preference capital at 4 per cent. The loan capital is to be in the proportion of one-third. Fittings may be provided on capital account.

The Commercial Gas Act makes provision for testing the gas supplied by the Company. The test burner is to be Sugg's "London" argand, as prescribed by the Company's Act of 1875, with the gas burnt at such a rate as shall give a light equal to 16 candles, and the chimney prescribed by the Gas Referees for 14-candle gas.

The Derby Gas Act extends the limits of supply to include the parishes and places of Chellaston, Elvaston, and Ashton-on-Trent. The existing capital of the Company is to be consolidated and converted into an equivalent amount of ordinary 5 per cent. stock, in £10 holdings. Additional capital of the same class to the amount of £125,000 is sanctioned, to be paid for within one month of purchase. Preference is to be given to bids of shareholders, employees, or consumers, who may also have the offer of unsold stock at the reserve price. The loan capital is in the proportion of one-fourth of the consolidated stock. The initial price of gas in the borough is 2s. 10d. per 1000 cubic feet, and 3s. 2d. outside, with a neutral zone upwards of 2d. The sliding-scale is to operate on the prices of the half year. The price of gas supplied by prepayment meters is not to exceed the ordinary price of other supplies to private consumers, with a surcharge of not exceeding 10d. per 1000 cubic feet for the hire of meter and fittings. The maximum charge for a prepayment meter without fittings is 10 per cent. on the cost to the Company. Additional lands are authorized to be purchased by agreement. Consumers' fittings may be specified. Mains may be laid in undedicated roads, and for ancillary purposes. Streets in Derby are not to be broken up without the consent of the Corporation. The Company may supply gas by contract, but must not give any preference as between contractors similarly situated. Discounts up to 25 per cent. may be allowed for prompt payment or larger consumption, or in respect of gas supplied by contract or for motive power. Gas of 14-candle power, tested by the "Wandsworth" burner, is to be supplied. A 6-inch by 1⅛-inch chimney is to be used; and the gas is to be burnt at such a rate as to yield the maximum light for which the burner is designed. The standard of light is Harcourt's 10-candle pentane lamp, with table photometer. No penalty is to be incurred for sulphur impurity unless the excess is 5 grains upon the average of six consecutive week days. Any person desirous of being elected as a director or an auditor must have been qualified for six months and give ten days' notice before the day of election, such notice to be posted in the office. Gratis flat-flame burners suitable for the gas supplied are to be provided and fixed within two years, on demand.

The Faversham Gas Act increases the share capital of the Company by £56,000 of either ordinary or preference stock, to be raised at the rate of £7000 for the first year and £2000 in any subsequent year. Gas of 14-candle power is to be supplied, tested with the burner yielding its maximum light; the former initial prices of 4s. and 4s. 6d. being reduced to 3s. 11d. and 4s. 5d. accordingly. Preference is to be given to the bids of shareholders, employees, or consumers at first stock auctions. Unsold lots are to be offered at the reserved price to holders of ordinary capital, and if not taken may be offered as before at a discount. The loan capital is in the proportion of one-third. Additional land powers are given. Discounts up to 20 per cent. for prompt payment or large consumption are sanctioned.

The Gaslight and Coke Company's Act authorizes the creation of debenture stock not exceeding the nominal amount of £750,000. No stock is to be sold otherwise than by auction or tender, and holders of the Company's capital or debenture stock are not, as such, to have any preference as regards tendering. The debenture stock authorized by the Act is to be known as "Second Three per Cent. Debenture Stock," and is to rank next after the Company's 3 per cent. consolidated debenture stock both as regards capital and interest. On and after Jan. 1, 1904, the standard price of the Company's gas is to be 3s. 4d. instead of 3s. 9d. per 1000 cubic feet. For every penny or part of a penny by which the authorized price in any calendar year exceeds or is less than the standard price, the dividend is for such year to be reduced or increased by 2s. 8d. in order to arrive at the authorized rate of dividend. Before the Company are entitled to distribute an increased dividend, they must, out of the divisible profits in excess of the amount needed to pay the standard dividend, set aside a sum up to and not exceeding £10,000. Having done this, they may distribute an increased dividend up to 6s. 8d. per cent.; and so on for every further 6s. 8d. distributed up to an increased dividend in excess of 5 per cent. The several sums thus set aside are to form a redemption fund. The term "divisible profits" here means the whole amount of the Company's clear profits, inclusive of any undivided balance carried forward. No increase of the dividend above the standard 4 per cent. is to be paid without making the provision already mentioned for the redemption of ordinary stock, which is to be effected during the year following the setting aside of the money, by purchase in the open market. In order that the price of the Company's gas may be kept down as much as the profits admit of, it is not obligatory on the Company to set aside out of revenue any sums for the purpose of writing off obsolete capital so long as this provision operates; and it is to cease when the amount of capital redeemed is one million pounds sterling. The reserve fund of the Company is not to be used for paying increased dividends above 4 per cent. Certain land holdings of the Company are confirmed. A clause is inserted to enable the London County Council to defray the cost of the Bill promoted by them to amend the Company's Acts. The cost of the present Act is to be paid out of revenue.

The Gorleston and Southtown Gas Act confers additional land powers upon the Company, and increases their capital by £40,000, of which not more than one-half may be preference capital at 5 per cent. Back-dividends must not be made up for any period previous to Dec. 31, 1892. Any unsold stock may be put up for sale again at a discount. The loan capital is to be in the proportion of one-third. The contributions to the reserve fund of the Company are limited to 1 per cent. on the paid-up capital, and the fund itself to 10 per cent. of the same. The Company may sell gas in bulk outside their district. Pipes may be laid in undedicated roads, and also for ancillary purposes with the consent of the Corporation of Yarmouth, which consent is not to be unreasonably witheld. If any question arises as to this matter of consent, an appeal is given to the Board of Trade. Consumers' fittings may be specified. The maximum price of gas is 4s. 9d. per 1000 cubic feet.

The Hampton Court Gas Act gives the Company further land powers, and increases the capital by £90,000, with one-third loan. The existing capital is consolidated and converted. The sliding-scale is enacted, with an initial price of 3s. 6d. and a neutral zone of 2d. downwards. Gas of 14-candle power is to be supplied, tested by the "London" argand No. 1 with gas burnt with maximum effect. Sulphur to the extent of 30 grains is allowed; and no penalty is to be incurred unless the excess of sulphur amounts to 2 grains upon the average of six consecutive days or 10 grains upon any one day. Clauses are inserted for the protection of the London United Tramways Company. The Company may make application for an Electric Lighting Order with the consent of the Local Authorities.

The Harrow and Stanmore Gas Act enables the Company to take additional lands, the compulsory powers to be exercised within three years. The capital is increased by £93,000 in new shares or stock. The profits of the Company available for dividend are made applicable first in payment of the perpetual cumulative guaranteed dividend to which the guaranteed shares are entitled, and all arrears. The balance of such profits is to be applied in payment of the respective dividends to which the other classes of capital are entitled, up to 6 per cent., after which the guaranteed capital participates again up to an additional 1 per cent. The loan capital is in the proportion of one-third. The standard price of gas within the central area of supply defined by the Act is 4s. per 1000 cubic feet, and 3d. extra outside, subject to certain conditions. The price is to be lowered to the stated figure by annual reductions of a penny, unless the cost of coal at the works justifies an advance. The latter fact is to be certified by a Referee appointed by the Board of Trade upon application by the Company. Sections 59 and 61 of the Act of 1894 are amended in the sense of making the "A" capital bear a 10 per cent. dividend. The price of gas for public lighting is to be 4d. per 1000 cubic feet less than that charged to private consumers for the time being. Pipes may be laid in undedicated roads, subject to the approval of the District Council; but this stipulation does not apply to the laying of ancillary pipes.

The Hexham Gas Act confers upon the Company additional land powers, and adds £30,000 to the capital, which is consolidated and converted. The borrowing powers are in the proportion of one-third of the whole nominal capital. The standard price of gas is 3s. 2d., with a neutral zone of 2d. Outside Hexham the price may be 1s. higher. Pipes may be laid in undedicated roads at the request of the frontagers. Discounts up to 20 per cent. are allowable.

The Ipswich Gas Act extends the limits of supply and sanctions the raising of £120,000 additional capital, of which not more than £75,000 is to be preference stock, with one-third loan. Undedicated roads can be broken up by consent of the Corporation. Consumers' discounts up to 20 per cent. are allowable. Consumers' fittings may be specified. In order to enable the Company to be represented at any testing for purity or illuminating power, the Corporation are to give them, at their principal office, reasonable notice in writing of their intention to make a test.

The Maidstone Gas Act authorizes the Gas Company to convert their capital from 7 to 5 per cent. stock, with an addition of £75,000. The amount of the insurance fund is not to exceed £5000. The borrowing powers are in the proportion of one-third. Gas of 14-candle power is to be supplied, tested by Sugg's 14-candle standard argand burner. Gratis flat-flame burners are to be furnished to consumers on request. The standard prices are 3s. 7d. and 4s. 4d. within and beyond a radius of 1½ miles from the Town Hall. Consumers' fittings may be specified. Undedicated roads may be broken up on request by the frontagers.

The North Middlesex Gas Act extends the powers of the Company, and sanctions the raising of £120,000 additional capital, of which not more than one-half is to be preference stock at 5 per cent. Preference is to be given to the bids of shareholders or gas consumers. The borrowing powers are in the proportion of one-third, at 4 per cent. The standard price of gas is 4s. 3d. A renewal fund may be created out of revenue, and as part of the expenditure on revenue account, by appropriating not more than ½ per cent. on the paid-up capital; and the fund is not to exceed 10 per cent. of the same. The Hendon District Council may provide a testing-place at their offices. It is optional with the Company to have tests made in accordance with the practice of the Metropolitan Gas Referees, instead of under the Act of 1871—except that the tests for illuminating power must be made at half-hour intervals. The Directors may determine the remuneration of the Secretary.

The Plymouth and Stonehouse Act extends the limits of supply so as to include the parish of Plymstock. Certain clauses for the benefit of the Corporation are inserted, notably an extension to 100 yards of the "50 yards" mentioned in section 24 of the Gas-Works Clauses Act, 1871. Additional capital to the amount of £100,000 is sanctioned, at 5 per cent., with one-third loan. The standard prices are unchanged. A renewal fund of 1 per cent. may be formed, up to 10 per cent. on the capital. Gas of 14-candle power is to be supplied; and gratis burners are to be provided on demand.

STATISTICS OF TRADE AND INDUSTRY.

The Blue-Book entitled "Memoranda, Statistical Tables, and Charts" relating to British and Foreign Trade and Industry, which was mentioned in the first of our "Editorial Notes" last week, is a volume of nearly 500 pages, containing a great mass of very varied information. Much of it does not specially concern readers of the "Journal" in a particular way, though, as matter of industrial and commercial interest, it is hard to say what is not pertinent to the serious questions now appealing for answers to British citizens. The very form in which the matter is put, being largely replies to specific questions addressed by Ministers to the Board of Trade, is engaging, because the queries are precisely such as any person of ordinary intelligence would put to obtain exact information of the description that everybody wants at the present juncture. The first inquiry dealt with is as to the value of the imports and exports of manufactured and partly manufactured goods into and from the United Kingdom, France, Germany, and the United States, for as long a series of years as possible. This evokes some striking comments, tables, and diagrams, showing many things to arrest attention and cause reflection. The next question refers to the course of the export trade of the United Kingdom with "protected" and "unprotected" foreign countries and colonies. The query is full of suggestiveness; and the observations it has called forth from the compilers show that to answer it properly is a task of enormous difficulty. Incidentally, it is recorded that the foreign countries of the "protected" group have a present population of 430 millions, which is enough to make Cobden turn in his grave.

It used to be a commonplace of those Free Trade doctrines on which Englishmen have been nurtured for fifty years, that Protection does not protect, inasmuch as that the consumers of taxed commodities will have them all the same, only at an artificially enhanced price. It appears to be the fact, however, that during these same fifty years the distribution of our total exports as between the protected and unprotected markets of the world has been reversed; the proportions in 1850 being 56 to protected and 44 to other markets, whereas in 1902 they were 42 to protected and 58 to other markets. Taking the category of manufactured commodities separately, the change has been even more marked. It has been continuous, and has of late years become more rapid; so that the official compilers state that there can be no doubt as to the effect of Continental and American tariffs in checking our trade to those countries, especially during the last two decades. It appears from the summary of the returns that the proportion of manufactured to total British exports has fallen continuously from 96 per cent. in 1850, when we still kept the workshops of the world, to 72 per cent. in 1900. This is to the principal protected countries and colonies, who meanwhile took our coal in ever-growing quantity, culminating in the record year 1900. In that year the protected countries paid us nearly 23½ millions sterling for coal, coke, and patent fuel, the weight being 29 million tons. Owing to the partial industrial collapse on the Continent, they have taken slightly less of our fuel since 1900.

The next set of tables contains the details of manufactured goods imported and exported. It is observed that caution is required in making these comparisons, for the reason that while the value of exports is given free on board, and therefore does not include freight, imports are entered including cost, insurance, and freight. These tables are very voluminous, and offer some highly suggestive figures. Germany, for example, sent in last year £466,471 worth of chemicals, and more cotton goods, brassware (much of which we may be sure was gas-fittings), and even crockery than ever before. The value of the imported coal tar dyes was £93,962, besides £13,799 for "extracts." Remarkably enough, in 1890 the imports of coal tar dyes were only £2203, while extracts were worth £18,396. It is curious that the Germanization of this comparatively small trade is always made the text of platform denunciations of English supineness and laudations of German scientific industry. Nothing is said in the same way of what is a much bigger business—the rapid growth of the German textile and glass trades, which depend more on labour than on science. The same observation applies to Belgium and Holland, which are Germany for this purpose. France, also, sends us much more cotton and woollen stuffs than is generally suspected. In point of fact, a good many lecturers and writers on the subject of British and foreign trades and manufactures must correct their stock illustrations and arguments by this return.

The figures relating to the exportation of British coal are impressive. In 1850 the total value of the fuel exported was £1,284,000. Roughly speaking, the value of machinery and mill work exported was at that period about the same as that of coal. The value of all other British exports, excluding ships, was about sixty-fold as much. Time passed, and the highest point of the export business for some years was reached in 1872, which was a period when war and the consequences of war were heaviest on our chief customers and trade rivals. Then there came a drop, so that 1879 was no better than 1866. Last year the value of coal exported was 50 per cent. more than that of all the machinery and mill work. The proportion of the coal to all other articles, except ships, was changed to about one in nine. Not a very reassuring alteration of the nature of the national export trade. It is a poor compliment to this country that its foreign customers prefer its raw natural product, coal, to anything the native workpeople can make by its aid.

A familiar side dish at the statistical banquet is the comparison between the values of imports and exports. For many years imports into the United Kingdom have always exceeded exports; the annual excess being about 161 millions sterling, with a tendency to increase. This has to be accounted for in making up the national balance-sheet. In such an attempt, the first thing to be done is to correct the export figure by the earnings of British ships in the carrying trade, which are not included in the ordinary statistics. One-half of the ocean freightage of the world is British, and its earnings are computed to be at least 102 millions sterling, not including the Colonial carrying trade. This sum must be added to the exports. Another addition has to be made for income received from foreign investments, which is not less than 62½ millions. These two amounts together more than account for the average difference between the values of exports and imports. There may be a marginal error of 10 millions in these computations.

Another set of tables relates to the supply of foodstuffs and raw materials into the United Kingdom. Among the latter is entered petroleum, for which we paid the United States last year 3½ millions sterling, and Russia not quite 1½ millions. Only £100,000 worth of petroleum came in from British possessions. The tables setting forth the particulars of the corn trade are significant. For the first time it is possible to obtain some systematized information respecting the tinplate trade, so seriously deranged by the United States tariff. Briefly stated, the effect of the tariff has been to kill the export trade to the United States, which was once worth 4¼ millions annually, and only to leave a residuum of 65,142 tons a year, which is practically the amount of the drawback plate re-exported to this country as manufactured goods. The production of tinplate in the United States has risen to more than the greatest quantity previously imported. Meanwhile, other markets have been found for the British-made article; and the number of mills appears to be actually increasing, though the loss of the American trade has not been recouped from other parts. This example of the tinplate trade is an experimental demonstration of what can be done by a tariff.

A large portion of the book relates to consumption of food and the cost of living of the working classes in the United Kingdom and certain foreign countries. This is very interesting matter; but seeing that the average expenditure for beer and spirits is left out of the inquiry, there is a considerable unknown quantity to be inserted in most of these family budgets. The returns go to show that working-class people have benefited greatly by the cheapening of most consumables during the past twenty years;

the fall amounting in the United Kingdom to 40 per cent., while the average rise of wages has been at least 20 per cent. An important part of the book relates to the export policy of Trusts in certain foreign countries; and here we have a fine opportunity for seeing the effect of the business arrangement of selling at two prices, of which the export one is the lower. An illustration given is that of the Westphalian Gas Coal and Coke "Kartell," which is asserted to systematically sell abroad for less than the home rates. The difference in 1900 was 8·2 per cent. Holland and Belgium got most of this benefit. At one time the price of coal in Germany was 18·50 marks per ton, while it was being sent to Austria for 8·80 marks. This difference, however, was explained by the existence of old contracts. Most of the German coke exported goes to France, at a low price. Some gets as far as the Mediterranean; leaving, after freight is paid, only about 75 per cent. of the home prices for the coke Kartell to share out. The same impeachment is levelled at the United States Trusts, which do not, however, generally admit it. Where the fact is proved, it is accounted for as a cutting of prices to obtain trade, as in the practice of the Standard Oil Company. Where it is desired to gain or keep a footing in a foreign market, lower prices for the export trade are accepted as a regular thing. Even trade at an admitted loss is preferred to no trade. "That their foreign prices have been, to a more or less material extent, lower than their domestic prices, the Trusts in some cases allow to be the fact, but not infrequently appear reluctant to admit."

An appendix to the book gives a brief abstract report of the proceedings of the German Commission on Kartells, which took evidence early this year on the operations of the Rhenish-Westphalian Coal Syndicate and the Upper Silesian Coal Convention. Statistics of the coal output of certain foreign countries are given.

ELECTRIC LIGHTING MEMORANDA.

The Methods of Municipal Trade—Misleading Comparisons of Electric and Gas Lighting—The Light of Luxury—The Muddle in Marylebone.

THE methods of municipal traders in electric light exhibit much variety. It is complained of some local authorities undertaking this business that they appear to do it, like the Scotch gentleman joked, with difficulty. It is true that the authority keeps a shop; but to make up for this there is nobody to mind the counter, much less to call for orders. The municipal trader, in other words, does his business in as unbusinesslike a way as possible. It does not matter—the rates will make good any deficiency! Now, there is much to be said for the rule of never doing things by halves; and it is quite arguable that if a local authority do electric lighting at all, they should do it on ordinary commercial lines. Even those who do not approve of the principle of municipal trading would be prepared to admit that, where it is done, it had better be done thoroughly. A municipal undertaking is not more likely to commend itself to an opponent of this kind of thing through being bound up in red-tape and hampered by stupid administration. A correspondent of an electrical contemporary complains that the Council of a Metropolitan Borough, in answer to inquiries about a supply of current, "send along forms of agreement and regulations which look rather formidable; their ultimate result being that one finds the Council require a minimum of 13s. 4d. for any one quarter during the year, and a deposit of £2 2s. This on an installation of six lights is a consideration; and in nine cases out of ten the Gas Company do the lighting." When the story is one of a trade rival, how archaic this system of requiring elaborate forms to be filled up, and a deposit paid, looks in the light of modern business! Yet it is not so very long ago that would-be consumers of gas were everywhere treated in the same discouraging fashion.

On the other hand, it is decidedly hard upon a Gas Company which contributes heavily to the rates, when the support of these same rates is relied upon for the municipal underselling of electricity, including the free supply of fittings, wiring, meters, and everything required by the consumer. We have before us a Corporation circular in which such an offer is made, accompanied by the statement that the electric light is cheaper than gas—easily shown by putting the price of gas about 6d. per 1000 cubic feet too high, and assuming an hourly consumption of 7 cubic feet as necessary to yield an equal light to that of a 16-candle electric lamp. This is not playing the game according to the rules. But they all do it: and the only way of correcting matters is to keep the public better posted. The quarterly gas bills can be easily made the medium of conveying true information to the public in respect to the duty and cost of gaslight. Of course, it is hardly necessary to remark that all such statements should be quite accurate. The truth is so adequate for the purpose that there is really no temptation to exaggerate. Indeed, the electricians dare not confess to a knowledge of the lighting efficiency of gas in an incandescent burner, or they would have to throw up this particular sponge. Twenty candles to the cubic foot is more than they can withstand. They are aware of the fact, of course; and the only thing to do is to make sure the public know it too.

Even so, there is a demand for a certain amount for electric light, which people will have, irrespective of cost, for some purposes. It is idle for Gas Companies to think of stopping this demand by bringing up the question of comparative cost, which is in the circumstances immaterial. The fact remains, and tells time and again, in the long run, with shops and places where the lighting bill is a consideration. And the brightness of incandescent gaslight, when used lavishly, beats the electricity even more often than the price. It is a great thing for gas engineers to remember that the thicker incandescent burners are placed the greater their effect, in far more than the direct arithmetical ratio. And there is so little heat from them that they can be fixed as thickly as is thought necessary anywhere. So that no well-managed Gas Company need begrudge an Electric Light Company their little bit of trade, which is done for the "fancy." Fancy shops can live, like the others. Gas engineers themselves have as good a right as other people to indulge their liking for a bit of electric light when it comes their way. But it goes against the grain to see this trade in a luxury of the well-to-do carried on at the expense of the rates. It is useless to grumble, but we shall never cease from grumbling at this misapplication of money that is badly wanted for other purposes. The small local authorities that are losing money and needlessly vexing themselves over this business all over the country had far better let the local Gas Companies, where there are any, do it as a side-line, merely to gratify the public. Broadly speaking, only those local authorities should do electric lighting who have their own gas-works.

As the matter has been chronicled throughout in this column, it is worthy of mention that one more round turn has been taken in the complications that surround the electricity affairs of the Metropolitan Borough of Marylebone. According to the programme of the Council, who must do everything that lies in their power to obey the order of the Court, and purchase the local portion of the undertaking of the Metropolitan Electric Supply Company, application was made to the Board of Trade for a Licence under the Electric Lighting Act; and the Board, as mentioned last week, have declined to accede to the request. There remains the Local Government Board, who are also empowered to grant these Licences; and it is reported that the Borough Council will make an application to them before giving up this particular expedient. It can hardly be expected, however, that the one Department will act contrarily to the other, on precisely the same premises. In the event of the refusal of the Local Government Board to intervene, apparently nothing more can be done in the sense of satisfying the order of the High Court. The Borough Council may deem themselves called upon to ask Parliament for the powers which they failed to grant in the Act passed for the purpose; but there is very little probability that the promotion of such a Bill would be approved of by the ratepayers. Surely, a greater muddle than the whole business was never made in the whole course of English local government.

COMPENSATION TO WORKMEN LAST YEAR.

THERE has just been issued from the Home Office a paper giving statistics of proceedings taken under the Workmen's Compensation Acts, 1897 and 1900, and the Employers' Liability Act, 1880, during the past year. The tables are arranged in three groups, relating respectively to England and Wales, Scotland, and Ireland; and they furnish all the statistical information available in regard to the working of the above-named Acts. Unfortunately, these statutes do not contain provision for the making of returns to show the operations of the systems of compensation they established; and consequently those under notice leave untouched the great body of cases of compensation to workmen. However, though compiled from comparatively limited sources, they contain interesting information of which the following is a summary.

The number of cases dealt with by County Court Judges and Arbitrators under the Workmen's Compensation Act during the past year was 1269, compared with 1370 in 1901. Of the former, 1200 were decided by Judges and 9 by Arbitrators; while 60 of them were settled by the acceptance of money paid into Court. The decisions by Judges were 89 less than in 1901; but the number was considerably in excess of that for each of the two immediately preceding years. In addition to the cases dealt with, there were 538 withdrawn, settled out of Court, or otherwise disposed of. Of the claims for compensation finally settled within the cognizance of the Courts, the decision in 801 cases was in favour of the applicant, and in 167 for the respondent. In 360 cases the award was a lump sum; in 441 a weekly payment. In 1901 the figures were 399 and 608. In 264 cases the compensation was granted on account of death; and in all of them the deceased had left dependants. The amount awarded was £44,353 5s. 1d. (a considerable decrease on the figures for the preceding year); the average amount being £168, against £188 7s. 7d. in 1901. With regard to the grants of compensation for injury, there were 96 cases in which it is returned as consisting of a lump sum; the average being £36 3s. 11d. In 441 cases of injury, a weekly sum was assigned—in 242 for total, and in 199 for partial incapacity. The average rate of weekly allowance for total incapacity for the last four years has been 10s. 11d., 11s. 6d., 11s. 10d., and 12s. 2d.; and for partial incapacity, 9s. 2d., 10s. 9d., 9s. 8d., and 9s. 11d.

An interesting table shows how far the number of cases under the Employers' Liability Act has been affected by the new rights conferred by the Workmen's Compensation Acts. Comparing last year with 1898, the reduction in the number of cases amounts

to only about 19 per cent., while the amount recovered is about 44 per cent. less. The figures are: Cases in 1898, 681; damages awarded, £16,853. Cases in 1902, 548; damages awarded, £9330. In 27 of the 548 cases, though the proceedings were originally taken under the Employers' Liability Act, the question of compensation was actually determined under the Workmen's Compensation Act, 1897, in pursuance of the power given by that Act. The average amount of damages awarded under the Employers' Liability Act last year in case of death was £115 7s. 10d.; under the Workmen's Compensation Act, £168 0s. 1d. There were 27 appeals by workmen and 32 by employers; six of the former and eight of the latter being successful. One appeal to the House of Lords was dismissed.

A comparison of the returns for 1902 with those for the years 1899 to 1901 (the first three complete years when the Workmen's Compensation Act was in force) does not show any great change in its operation. Compared with 1901, there was a falling off both in the number of cases taken into the Courts and in that of those carried to the Court of Appeal. As in previous years, the great majority of the claims were settled by agreement, and only a small percentage were made the subject of formal arbitration.

CAUSES OF BREAKDOWNS OF GAS AND OTHER ENGINES.

In most unexpected places, one sometimes discovers instructive matter. Perusing the recently issued report of the Chief Engineer of the Engine, Boiler, and Employers' Liability Insurance Company, Limited (Mr. Michael Longridge, M.A., M.Inst.C.E.), it is found that the incidents recorded in it from the daily experiences of the Company are such that they cannot fail to convey to the users of steam and other machinery a fair idea of the kind of risks the use of such machinery involves, as well as hints as to the means by which these risks may be lessened. The most effective of these means is, of course, intelligent periodical inspection, such as, judging by the report, is given by the Company. There is an abundance of evidence to prove how enormously periodical inspection has, during the past forty years, reduced the number of boiler explosions, and consequently loss of life, and also how few are the lives lost at the present time by explosions of insured boilers compared with uninsured. Unfortunately, no record exists as to the number of breakdowns of steam and gas engines and other motors, to prove the value of inspection when applied to them; but there can be little doubt that it is at least as advantageous as it has been in the case of boilers. However, here and there in the report, there is a good deal of information to be extracted which may be turned to useful purpose by both makers and users of these classes of machinery; in other words, from the misfortunes of those engine users who experienced breakdowns in 1902, as recounted in the report, they themselves and others may largely profit.

These breakdowns of insured steam, gas, and oil engines may be classified as follows:—

	Steam-Engines. Per Cent.	Gas and Oil Engines. Per Cent.
Due to accidents or causes unascertained	30	34
,, negligence of owners or attendant	23	35
,, old defects or wear and tear	24	19
,, weakness—faulty design or bad workmanship	23	12

This comparison is interesting; but it is a matter for regret that the percentage of unascertained causes of accident is so large. Accidents due to negligence make gas and oil engines stand in poor contrast with the steam-engines; but it is satisfactory to find that accidents due to weaknesses in respect of faulty design or bad workmanship show a marked superiority on the part of the gas and oil engines, though it is not an agreeable thing to see that defects in these respects occupy even the position they do in the total of accidents. It is interesting and instructive, however, to investigate the particular parts of the engines which, by their failures, caused the breakdowns in the year; but in doing this we must confine ourselves to gas and oil engines. It is found that valves and valve-gear were the worst offenders, and cylinders and cylinder ends and covers came next. Following these are piston and piston-rods; but accidents to other parts were relatively light. The figures are as follows:—

Gas and Oil Engines.

	During 1902.
Valves and valve gear	24
Cylinders and cylinder ends and covers	12
Pistons	9
Connecting-rods	8
Main-shafts	3
Governors and governing gear	3
Fly-wheels	3
Clutches and couplings	3
Silencing-boxes and exhaust-pipes	3
Bed-plates and pedestals	2
Bolts	2
Total wreck—cause not ascertained	1

To illustrate the breakdowns, a number of examples are given, among which there are points worth marking. There is a case of a gas-engine, with a cylinder 18½ inches in diameter by 30-inch stroke, running at 160 revolutions per minute. The cylinder end containing the valves was found to be cracked, and also the liner. The cause was overheating, owing to accumulation of deposit in the water-jacket. Three other cases of the same kind occurred during the year; and they all point to the necessity for providing a sufficient number of doors and plugs to allow every part of the jacket to be cleaned. It is complained that it is rarely that proper facilities are provided for cleaning, although the water in many districts makes this imperatively necessary. It is found too that the jackets of four gas-engines were burst by frost. Three of these accidents were due to the carelessness of the attendants in leaving water in the jackets all night. The fourth was due to the mistake of a plumber who had been called in to mend a lead pipe supplying the water to the cooling tank. The owner had drained the jacket; but the plumber, after mending the pipe, turned the water into the cistern and shut the jacket drain—thus leaving the jacket full of water, which froze in the night.

Another example of accident gives scope for a little criticism. It is that of a horizontal gas-engine, with cylinder 11½ inches diameter by 18-inch stroke, running at 170 revolutions per minute. The crank-shaft had three bearings, and carried at one end an overhung fly-wheel, and on the other between one of the main bearings and the outer bearing, a second fly-wheel, from which the power was taken by a belt. The engine drove a dynamo for lighting. The crank-shaft broke suddenly, close to the crank, on the side next the driving-wheel. The two crank arms and pin, with the short end of the shaft and overhung fly-wheel attached to them, part of the frame forming the bearing for this end of the shaft, and the connecting-rod and piston were driven forward, and struck, and broke, the bed-plate of the dynamo. The engine frame, which was cast with the cylinder, was also broken. The cause was apparently excessive stress on the neck, which failed owing to the bearings being out of line. The shaft had been failing gradually; the final break bearing a small proportion to the total cross section of the shaft. The growing practice of carrying the crank-shafts of horizontal gas-engines on three bearings—the outer one entirely detached from the engine frame—without any special provision ensuring alignment vertically or horizontally is, in Mr. Longridge's opinion, certain to result in the breakage of many shafts. Even the division of the brasses into four segments, with adjustment for the side segments of all bearings and vertical adjustment by folding wedges or screws for the outer bearing, would be but a doubtful improvement, save in the hands of a very skilful engine-driver. If more than two bearings are required, inverted vertical engines will probably have to be adopted; and—according to the opinion of the same expert—the sooner gas-engine makers realize this the better for all concerned. With these, there is adjustment of level only to be considered. To keep three or more bearings in line and level—where wear takes place downwards by the weights of the parts, and horizontally owing to the thrust of a horizontal piston—is a task too difficult to expect men to undertake in every-day work. For horizontal engines, the alternatives seem to be two bearings with overhung cranks, or an independent shaft to carry the dynamo or belt drum or rope drum supported on its own bearings.

Reference to one other form of accident may be given in conclusion. This was a horizontal engine of unknown age, with 8½-inch diameter cylinder by 13-inch stroke. When the attendant attempted to start the engine one morning, an explosion occurred inside the frame, which blew out the sides of the frame, broke two arms of the fly-wheel, and bent the crank-shaft. The cause was an accumulation of gas inside the frame, owing to leakage through the air-valve, which opened into the frame. Several other engines receiving their air through the frame, it is reported, have exploded in the same way in recent years.

This glance at portions of Mr. Longridge's report is sufficient to show the nature of the interesting matter embodied in its pages. It is from one end to the other an account of failures; and from these, as we have attempted to show, there is something to be learnt by all interested in the types of engines to which attention has been more particularly directed here. Besides this view of the matter, there is another; and it is that the value of periodical inspection of boilers and engines of all kinds by an engineer who, from large and varied experience, must be able to readily diagnose constitutional and other defects, is abundantly confirmed by the report.

The Institution of Gas Engineers and the Projected Crystal Palace Gas Exhibition.—Mr. Walter T. Dunn, Secretary of the Institution, writes that the Council considered, at a recent meeting, the request of Mr. George Collins Levey, C.M.G., the Commissioner of the International Exhibition of Gas Plant, Lighting, Heating, Power, Hygiene, and General Smoke Abatement Appliances, to be held at the Crystal Palace from Dec. 15 to Jan. 16 next, that the Institution should extend its patronage to the exhibition. The Council have assented, on the understanding that the Institution incurs no legal or pecuniary liability in doing so, and is not identified with, and accepts no responsibility with reference to, any awards that may be made. It was decided to co-operate in the matter as far as possible with a view of making the exhibition a complete success.

THE HOME OF THE INCLINED RETORT IN ENGLAND.

The approach to completion of a new inclined retort house at the Southall works of the Brentford Gas Company affords a good opportunity for presenting readers with some notes as to what has been, and is being, done in respect of the system at the two works of this highly prosperous concern; and this we are able to do through the kindness of the Company's Engineer and Manager (Mr. James Husband) in showing the writer the whole of his carbonizing plant on the occasion of a recent visit. Gas engineers generally have only a floating knowledge of what has been accomplished at Brentford and Southall in this matter of inclined retorts. They know that the title which we have given to this article applies to these works; that the Gas Company have pinned their faith to the system so securely that, as time has passed, the number of inclines have gradually come into the ascendant there; that horizontals have only been treated for some time now as stand-bys; and that it will not be long hence before horizontals, so far as this Company are concerned, will be completely effaced from the working. Why is this? Simply because, the Company's chief official, his predecessor—Mr. Frank Morris, now a member of the Board—and the Directors (as those who have followed the statements on the subject by the Chairman, Mr. Howard C. Ward, at the half-yearly meetings will know) have for some years now been firmly convinced that they save, and save largely, by this method of carbonizing.

However, though little is generally known, what has been done at Brentford has been open to the inspection of anyone for the mere asking; but in talking about their work, both Mr. Morris in former years and Mr. Husband in latter years have been—it is of their character to be so—rather reserved. At the same time, many have profited by their experience; but, from personal observation, we say (without asking their permission) that this has never been adequately acknowledged. In writing of that experience, it should be mentioned that the present chief at Brentford was Mr. Morris's assistant at the time of the advent of the inclined system there some fifteen years ago; and therefore he is intimately conversant with the whole of the facts connected with the pioneer work. The story of that time is interesting; and we will lightly run over it and subsequent developments.

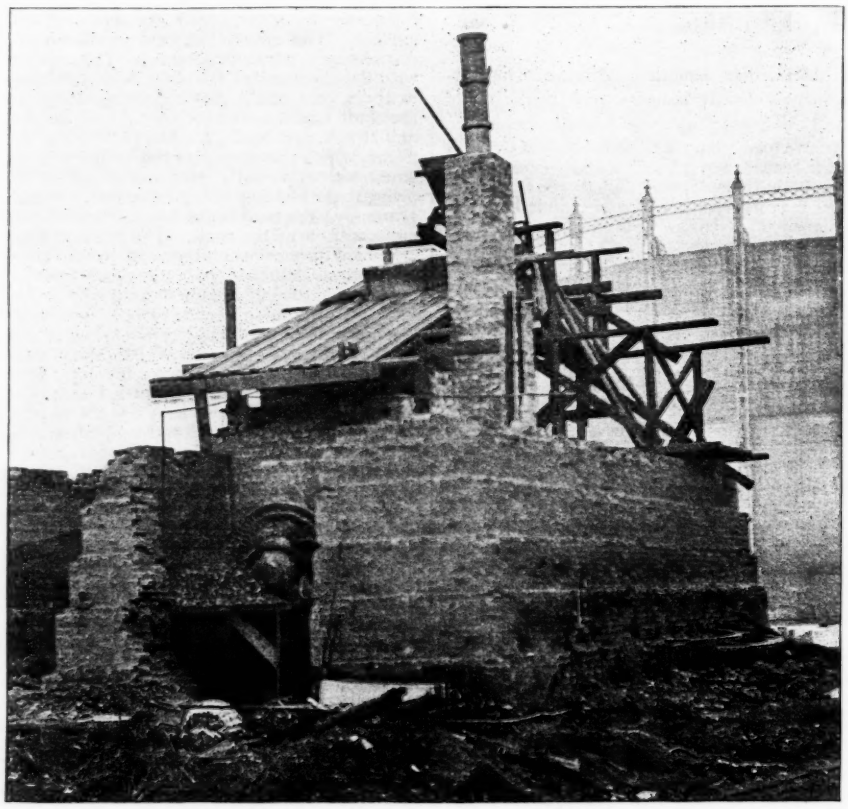


Fig. 1.—The First Inclined Retort in a Scotch Kiln at Southall.

From 1889 to 1903.

It was in 1889 that Mr. Morris, attracted by the accounts published of Mr. Coze's system and its working at Rheims, went twice on to the Continent (in company with Mr. Van Vestraut, who was then one of Mr. Morris's assistants at Southall) to make an investigation on behalf of his Company. Directly afterwards, the first inclined retort in this country was tried in a Scotch kiln at the Southall works. We have borrowed from Mr. Husband a photograph of this primitive installation; and the historical interest attaching to it justifies its reproduction (fig. 1). The retort was 20 feet long by 21 in. by 13 in., Ω section. From this trial sprang, in the early days of 1890, two trial beds of seven 20-feet retorts; and these may be taken as the beginning of the inclined retort system in this country. This beginning was, in the opinion of Mr. Morris and those associated with him, so successful that, by May 30 of that year, the first charge was put into a larger installation in No. 3 retort-house at Southall. The retorts were set seven in a bed, and were 20 feet in length. Time, however, has brought about the complete dismantling of this house. Then in 1891 Mr. Morris converted the horizontal retorts in No. 1 house at Brentford into eight settings of 20 feet sevens. The same year a start was made with the conversion of No. 1 house at Southall; and before many months were over, 26 settings were established, built back to back—the retorts being 15 feet long, and set in sevens. It should be explained that the reason 15-feet retorts were adopted in this instance was that, if 20-feet ones had been installed, only 13 beds could have been accommodated in the house; but, by adopting the shorter lengths, and setting them back to back, a larger carbonizing capacity was obtained. We give a drawing of the settings in this house (fig. 2); and about it something more will be said presently. Then in 1892, a new house (No. 4) was erected at Southall; and in it 18 sets of 20-feet sixes were put in. The same year also saw the installation of the second bench of eight settings at Brentford; and in 1895, a further house was converted there to fourteen beds. In short, the process of establishing the inclined system has been proceeding until now there are only 22 beds of horizontals standing at Southall; and there have been none at Brentford since 1895. Those at Southall are now merely used to meet any pressure in the winter months, and will, as they fall out of use, be replaced by the system which the Company have found so successful.

To-day the numerical position of inclined retorts at Brentford and Southall is this—

	Retorts.
Brentford—	
30 sets of six 20-feet retorts	= 180
Southall—	
26 sets of seven 15-feet retorts	= 182
18 ,, ,, six 20-feet ,, ...	= 108
25 ,, ,, six 20-feet ,, ...	= 150
[This is the new house now nearing completion.]	
Total	620

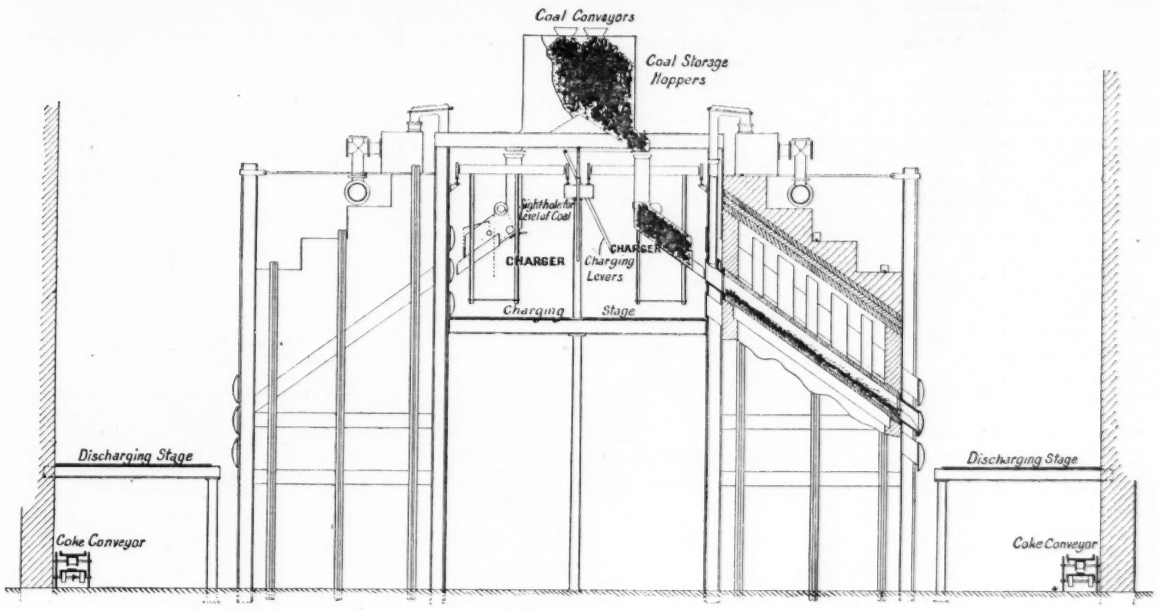


FIG. 2.—CROSS SECTION OF THE RETORT-BENCH IN THE 1891 SOUTHALL HOUSE.

Put in another way, the Company have now 11,490 feet of inclined retorts. It will be observed that, with the exception of 26 sets at Southall, the retorts are set in beds of sixes. Mr. Husband finds this preferable to having the seven; for, without the bull's-eye, he gets a more equable heat throughout each setting, and a lower temperature suffices. Simplicity is the leading characteristic of

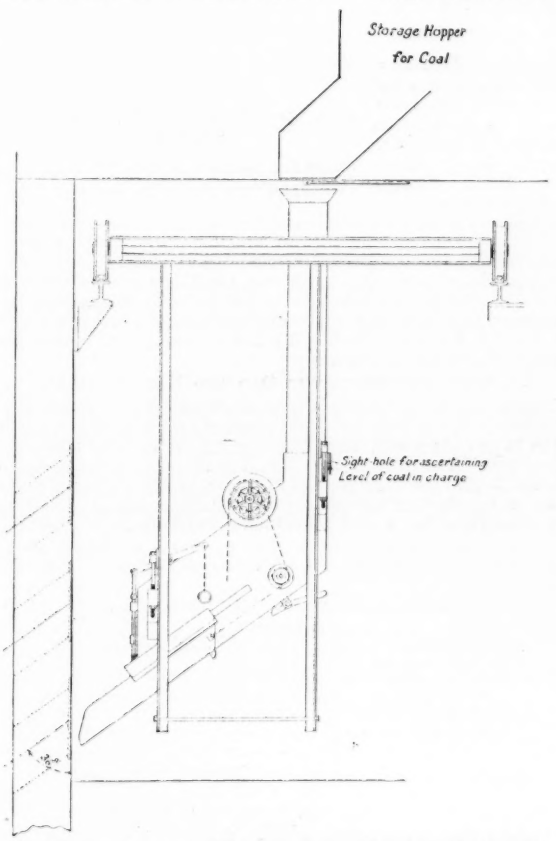


FIG. 3.—THE CHARGER INVENTED IN 1890, AND ADOPTED AT SOUTHALL IN 1891.

the settings at Southall and Brentford; and in both the Company's works it can be said with truth that it is difficult to find anything in connection with the system on which a penny of capital has been uselessly spent. This will apply not only to the inclined retorts, but to all the other plant.

HONOUR TO WHOM HONOUR IS DUE.

Before we leave this brief sketch of the adoption of the inclined retorts at Brentford, there is one thing about the No. 1 Southall house which cannot fail to strike anyone with experience in inclined retort work, and that is the method of charging. After looking into this, and other points about the working, we cannot help feeling that the Engineers of the Brentford Company have not had placed to their credit all that they are entitled to in connection with the development of the inclined retort system. The method of charging in this house is precisely the same to-day as it was in 1891 when the inclines were first installed; and to the Manager of the Southall station (Mr. W. Bugby) is due this recognition of his ingenuity in first designing the successful charger in existence there. In the "JOURNAL" for July 29, 1890, there appears in the "Register of Patents" the following: "10,713—W. BUGBY, 'An Improved Portable Apparatus for Charging Inclined Gas-Retorts.'" In his modesty, Mr. Bugby did not think it worth while to proceed further in the protection of his rights; and the result has been that the acknowledgment attaching to a successful invention has not been his. But the fact remains that in 1891, as shown in the cross section of the settings in No. 1 Southall house, he had in use the system of charging there illustrated, and that was the one for which he made application for protection in 1891. The method comprises a separate charger for each line of retorts; and, as will be seen, the arrangement is such that an even drop for the charge into all three lines of retorts is secured. The character of the charger is sufficiently described by the drawings (figs. 2 and 3). The valves—one for each vertical line of retorts—admitting coal to the charger measuring-chamber from the storage hopper is operated by levers along the centre of the stage. At the back of the measuring-chamber is a sight-hole for regulating the quantity of the charge. Underneath the measuring-chamber is a little hand clip for holding the shoot leading to the retorts in position when the machine is not in use. At the side are a ring and chain by which the gate is raised which releases the charge into the retort. These shoots are traversed along overhead rails by hand or chain-and-wheel gearing. It will be recognized that many installations in the country are fitted with this method of charging; but there are few engineers who know of the Southall designer of 1891. That, however, is not all. In the early installations at Brentford, another system of charging was adopted which, to say the least, bears a striking resemblance to other popular methods. In this case, the measuring-chambers are fixed to the bottoms of the overhead hoppers; and the coal is fed into the retorts by means of travelling shoots, in which adjustable checks are fixed (figs. 4 and 5). Two levers are now used for the operation—the one opens the valve which allows the coal to pass from the hopper into the measuring-chamber, and the other opens the valve at the bottom of the latter, and releases the charge for feeding the retorts through the travelling shoot. Both methods Mr. Husband pronounces to be equally good; but, in the new house, he has adopted the latter plan. Retorts charged by either system show that, from the point of view of the evenness of the charges, there is nothing to choose between them, though, perhaps, with the latter method, the operation of the charging-shoot from retort to retort claims a little less exertion on the part of the men engaged.

ANGLES AND TEMPERATURES.

We must revert to No. 1 Southall house, in order to bring out another rule in construction which has been evolved from the working there and at Brentford. It has been shown that six in a bed is one rule; and the second is that an angle of 31° is found to be the best for the working of the retorts. In the No. 1

Southall house an angle of 36°, owing to the special circumstances, was adopted. But all retorts are now set at 31°.

Again, in a previous paragraph, reference was made to the reduction of the temperature at which the settings are worked. With seven retorts set in a bed, the heats used to be approximately 3000° in the combustion chamber. Now heats of 2200°, and sometimes even lower, are the rule, and the working under these conditions proceeds with a smoothness that the most fastidious engineer could not complain about. The retorts are not nursed in any way; yet the working goes on with almost monotonous regularity. Several retorts were seen discharged. In some cases the first foot or so of the charge required a little persuasion; but after that nothing was needed on the part of the men but the occasional release of the larger lumps from the mouthpiece. This is sufficiently near to automatic working for the Engineer of the Brentford Gas Company. He attributes this ease in operation to the uniform heats that he obtains throughout each setting with six retorts in a bed, and working at lower temperatures than in the old days. Each setting, by the way (according to his present mode of construction), is a complete unit in itself; and each bed, as well as the furnace arch, is divided with a cross wall—thus practically separating the set into two. The wall in the furnace arch is formed with an opening by which the amount of gas for heating the retorts can be regulated. This system of construction was first experimented with at the end of 1891, and from that time it has been the method followed at the Company's works. The charges are $4\frac{1}{2}$ cwt. in the 15-feet retorts, and $6\frac{1}{4}$ cwt. in the 20-feet retorts; and six-hour working is the rule.

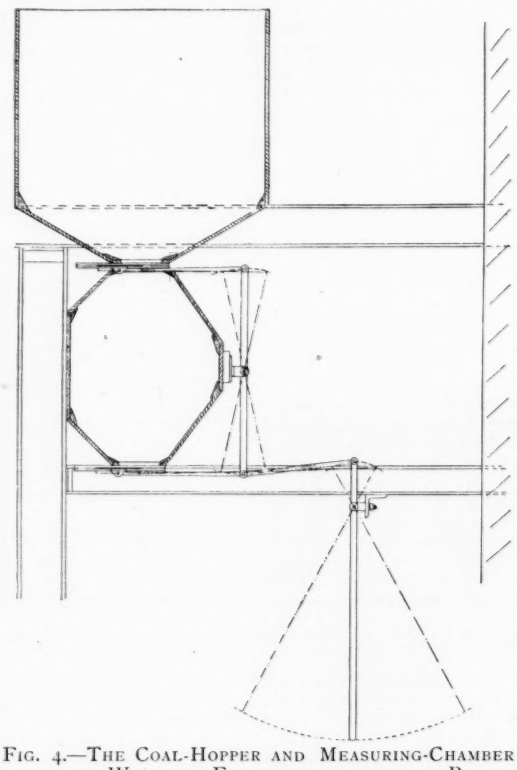


FIG. 4.—THE COAL-HOPPER AND MEASURING-CHAMBER MADE OF WOOD AND EXPERIMENTED WITH AT BRENTFORD IN 1890: THE FORERUNNER OF THE SHOT-POUCH SYSTEM.

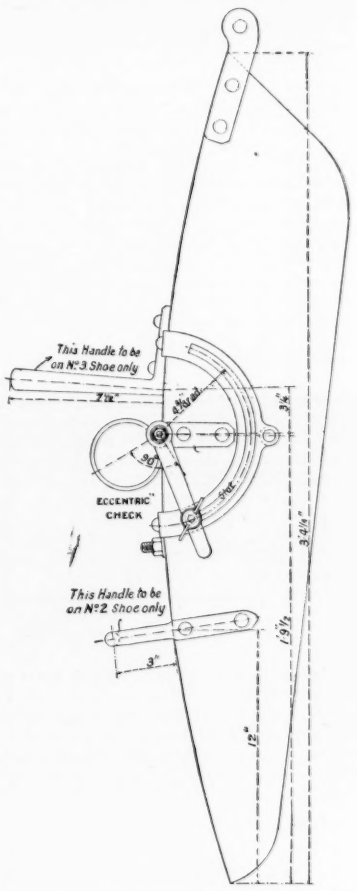


FIG. 5.—CHARGING-SCOOP AS USED SINCE 1892.

(When first used in 1891, instead of an eccentric check, a simple check plate was employed.)

SLIPPING CHARGES AND A VARIETY OF COALS.

This question of the free exit of the spent charges has some relation to that of the slipping of coals. Mr. Husband ridicules the idea of having to pick and choose coals for use in the inclined retorts, in witness of which the following list of the names of the coals that have been used during the past few years may be given: Ravensworth Pelaw, Pelaw Main, Pelton Main, New Pelton, Deaf Hill, Thornley Gas, Hebburn Gas, Hebburn Main, West Leverson's, Wearmouth Gas, Wingate Grange, South Hetton, Chirton Gas, Garsfield, Deans Primrose, Holmside Gas, Boldon Gas, Orgreaves, Silkstone Gas, Wearmouth Hutton, Washed Gas Nuts, Aldwarke Main, Durham Gas, Leverson's Wallsend, Felling Main, Etherley Grange, Silksworth Rough, Brandon Gas, Londonderry Gas, Wickham Gas, Wear Valley Gas, Thornley Hutton, Clay Cross Small, Yorkshire Gas, Barnsley Nut Gas, and Gas Peas. There is a good broad variation here; and it would be interesting to hear the comments that engineers who attribute the slipping to the class of coals have to make on this list. The coals are used indiscriminately, just as they are delivered, or brought out mixed from the store. In the 620 retorts on the two works, there are occasional slips here and there. But this is abnormal, and Mr. Husband merely attributes it to temporary defective heating. If the heat is regulated properly to thoroughly burn off the charge (without going to the extreme heats in vogue in many works), there will, he feels convinced from his experience, be very little slipping. Touching further on this point as to the slipping of charges, it should be stated that the rule at Brentford and Southall is the parallel retort; the tapered form being regarded with disfavour. The view is that, if anything, the taper would facilitate slipping; and Mr. Husband jocularly observed, when questioned on the point, that if he used tapered retorts, he should at times prefer the smaller end for the outlet, so as to prevent the spent charges tumbling out on the release of the stopper.

COAL BREAKING AND COKE CONVEYING.

From the general information gathered on this visit to Brentford and Southall, there are two or three more points which may be mentioned before describing the new retort-house. Contrary to custom, mechanical coal-breakers are not resorted to. The coal is simply dumped on to strong iron riddles fixed over the elevator boots, and all pieces that will not pass through are broken by the attendant. The coal is then elevated, and transmitted to the overhead hoppers by conveyors. Though not the case in the first installations, preference has for some years now been given to continuous hoppers, as being far cheaper in construction. Another change from the ordinary practice is found in the transmission of the coke from the retort-houses at Southall to the coke heaps. Although the Brentford Company may claim to have been the first to have adopted a hot-coke conveyor in an inclined retort-house, the Engineer has no liking for them, and prefers the coke to fall through shoots into the basement, and then be quenched before being carried away by a conveyor to the coke yard. All the elevating and conveying plant is driven by gas-engines.

LABOUR COSTS UNDER THE OLD AND NEW WORKING.

Now one of the great points that has been made in connection with the change from horizontal to inclined working at Brentford is the large reduction it has effected in the carbonizing wages per ton of coal. The latest figures obtainable for comparison refer to the working, in the early part of this year, in the horizontal retort house at Southall, of 108 mouthpieces (54 through retorts) and the recent costs in Nos. 1 and 2 inclined retort houses at Brentford, which are both worked by the same gang—each house containing eight beds of sixes: $8 \times 6 = 48 \times 2 = 96$ retorts $\times$ 2 mouthpieces = 192.

SOUTHALL HORIZONTALS (HAND CHARGED).
(54 Retorts.)

2 scoops at 6s.	=	12s. 0d.
4 stokers at 5s. 9d.	=	23 0
2 coke spreaders at 4s. 9d.	=	9 6
⅝ fireman at 6s. 5d.	=	4 3
1 poker-in at 4s. 10d.	=	4 10
1 pipe jumper at 5s. 9d.	=	5 9
		59s. 4d.
		3 Shifts
		178s. 0d.

108 mouthpieces × 12 cwt. $= \frac{1296}{20} = 65$ tons = 2s. 8d. per ton.

BRENTFORD INCLINES.
(96 Retorts.)

1 charger at 6s. 10d.	=	6s. 10d.
4 stokers (on drawing-stage) at 5s. 11d.	=	23 8
1 pipe jumper at 6s. 2d.	=	6 2
1 fireman at 6s. 5d.	=	6 5
1 boy at 3s. 4d.	=	3 4
		46s. 5d.
		3 Shifts
		139s. 3d.

139s. 3d. ÷ by 122 tons = 1s. 1¼d. per ton.

The comparison, of course, will be open to the criticism that the horizontal house is not a machine-worked one, and that the figures for that house embrace coke men. But in regard to the latter point, it may be mentioned that the four stokers in the inclined retort work throw back the coke.

The New House at Southall.

This brings us to a brief description of the new house (known as No. 5) at Southall. As has already been intimated, it is an inflexible law at Brentford that nothing shall be spent on buildings or plant beyond what is required for actual service; and from what we have learned as to the cost of this new house, it must be said that, for a cheap piece of construction, it is an object-lesson. For many years past, steel framework buildings, with galvanized iron covering, has been the form of construction favoured; and the experience has confirmed the wisdom of its adoption. This is the style in which the new house has been constructed. The Contractors for the building itself were Messrs. Samuel Cutler and Sons; and a little information as to its character was conveyed in the paper which Mr. Samuel Cutler, jun., read at the recent meeting of the Eastern Counties Gas Association. The house has a span of 50 feet, and is 246 feet long, with a height of 42 ft. 6 in. from the floor to the eaves. The framework consists of 12 in. by 6 in. by 6 in. steel stanchions of single girder section, placed at 8 ft. 11 in. centres, and stayed laterally by steel joist purlins, 5 in. by 4 in. by 4 in.; these forming a series of rectangular panels. The roof has ordinary open-trussed principals, coincident with the stanchions, and slated on angle steel purlins, laid 10-inch gauge in the usual way. Wind-bracing bars are provided to triangulate certain of the side panels, and the corresponding bays of the roof. To show the facility with which this class of structure can be carried out, it is worth mentioning that practically the whole of the stanchions were constructed on the ground. A portable drilling-machine was installed on the site, and the whole of the holes were drilled to template and erected direct. This saved the carriage to and from the Contractors' works. The sides of the framework are covered with galvanized iron sheeting, but only to about two-thirds of the depth from the eaves—the bottom part having been left entirely open for the purpose of inducing a current of air to pass up behind the beds, and get a free circulation of air on the charging-floor (see figs. 6 and 7). One other point which favours this method of covering is that in summer time it is a simple matter to remove parts of the sheeting to obtain any amount of ventilation. This combination of steel framing and galvanized sheeting construction was adopted for the carburetted water-gas house; and the sheeting looks as good now as when it was put up five years or so ago. In the retort-houses at the Brentford works, steel framing and galvanized sheeting are also largely employed; and the material is practically as sound as the day it was erected twelve years ago.

However, returning to the new Southall house, there has not been any haste in finishing it. It was taken in hand by the Company well before it was required; and its complete equipment—settings, hoppers, and stages—has been carried out entirely by the Company's own men as opportunity offered from time to time. There are in all 25 beds of six retorts, ⊓ section, 24 inch by 14 inch, parallel, and 20 feet long. The furnaces are ordinary regenerative settings, improved by Mr. Husband from his large experience with the previous settings. There is not a single special brick used in them. The ascension-pipes are 6-inch; the hydraulic of ∪ shape; and the connections from the latter 8-inch. At present twelve of the beds are in operation; and the remainder will be ready for the winter's work. The bench is 17·6 wide, the charging-stage about 17 feet, and the drawing-floor 14 feet. The stages are merely constructed of iron plates, but they are kept nicely cool through the free circulation of air from below. The continuous overhead coal-hopper is 6 ft. by 7 ft., and has a capacity for 24 hours' supply. The charging arrangements consist of the fixed measuring-chambers, with a travelling shoot for each line of retorts, as in the case of the old houses at Brentford. The coal elevator and conveyor was carried out by the Chain Belt Engineering Company; and these are the only parts of the internal work let out to contract. The system of disposing of the coke will be to let it fall through shoots into the basement, there quenched, and then conveyed away to the coke-yard. This is a sufficient description of the new house, read in conjunction with the general notes on the working of the inclined system at these works. In this new house we find the plainest of plain inclined retort work; and yet from it Mr. Husband is confident of achieving equally good results as have been realized now for many years past in the works under his charge.

This article is nothing more than a collection of notes made during a visit to the works; but they bring out several interesting points in the experience of two Engineers who (associated in work and kinship) have been identified with the development and working of the system from the first trial with the single retort in the old Scotch kiln. What they do not know about the system can hardly be worth knowing; and their experience has led them to advise that a Company sending out 2,200,000,000 cubic feet of gas per annum should put their whole trust in inclines, notwithstanding all that is said in disparagement of the system in many other quarters. In justification whereof, Mr. Husband can point to-day to the financial position of the concern, and the ease with which it floated through the troublous times of but recent years. The district of the Company covers some 50 square miles. In it there are large areas of undeveloped land. But building is proceeding apace; and, moreover, the new class of property is that which is largely gas consuming, and not of a kind in which electricity will be courted. By these foretokens, confidence is given in predicting a continuance of the growth of the splendid prosperity of this Company.

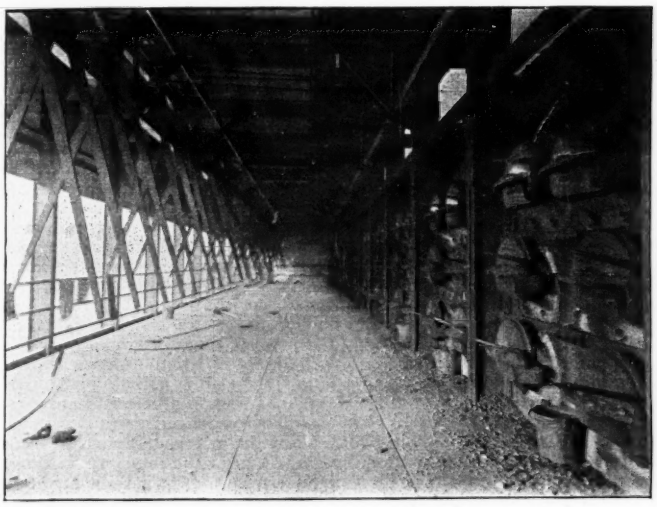


Fig. 6.—The Charging-Floor in the New House.

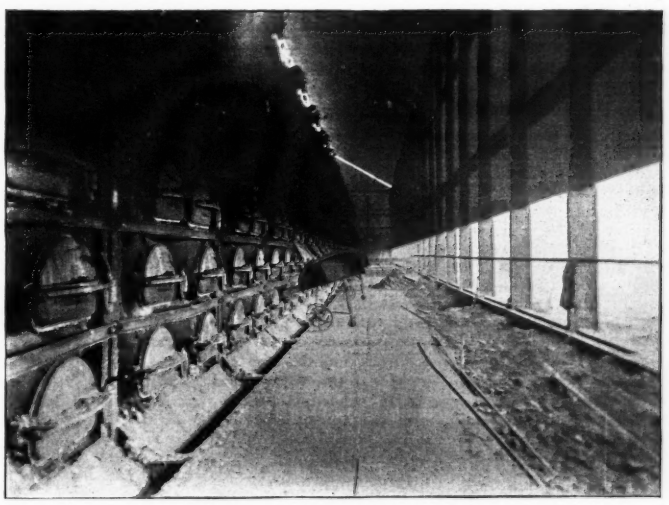


Fig. 7.—The Discharging-Floor in the New House.

The Advantages of Gas-Engines.—In a little handbook of about a hundred pages, published by Messrs. Merritt and Hatcher, Limited, Mr. W. A. Tookey gives some useful hints to purchasers on the advantages, action, and application of gas-engines, and to erectors and attendants on their fitting up and management. The matter is divided into three parts, in the first of which the author furnishes answers to certain questions in the order in which they would probably occur to a power-user, especially in regard to the cost of running. The second part consists of a few notes calculated to assist foremen and others who have the supervision of gas-engines; while the third contains some observations about starting, probable failures and defects and their remedies, and some useful hints to attendants. The author has produced a little book which will be of service to people who desire to know what the installation of a gas-engine entails.

PERSONAL.

The Retirement of Mr. Field—Changes in the Staff of the Gaslight and Coke Company.

Our readers may remember that in the "JOURNAL" for the 16th of June we announced that Mr. John W. Field had, in consequence of ill-health, tendered to the Court of Directors of the Gaslight and Coke Company his resignation of the position of Secretary and General Manager, and that it would take effect as from the present or next month. Mr. Field is now away on his vacation; and we understand he will not return to the Horseferry Road. As already announced, the duties discharged by him have been divided between Mr. Henry Rayner, formerly the Assistant-Secretary, who has been entrusted with the secretaryship, and Mr. David Milne Watson, who assisted Mr. Field in the other branch of his work, and has been appointed General Manager. These gentlemen, who have lately had the advice and help of Mr. Field, have now assumed the entire responsibility for their respective departments. So important a change in the administration of the Company as the severance of Mr. Field's connection with it could not, of course, but be a matter of regret to the Directors, who placed upon record, in the form of a resolution, their deep sense of the "energy and devotion to the Company's interests" which had been "the guiding principles of his long and faithful service." At the half-yearly meeting of the Company in August, the Governor (Sir W. T. Makins Bart.) gave further expression to these sentiments, and said it would be impossible for anyone to watch Mr. Field's work, and join in it, as he had done, without being amazed at his industry; and he expressed the hope that by relinquishing in time an occupation in which he delighted, his health would, after a period of rest, be as good as ever. In this hope we most cordially join. Mr. Field is the son of the late Mr. John Field, the Accountant of the old Imperial Gas Company, and the projector, some five-and-thirty years ago, of the annual "Analysis of Gas Accounts" which has now become an indispensable work of reference in arbitration and parliamentary inquiries in connection with gas undertakings. Mr. John W. Field was then in the service of the Gaslight and Coke Company, of which he became the Accountant. On the resignation of Mr. John Orwell Phillips in the spring of 1893, Mr. Field was appointed Secretary and General Manager. In relinquishing these important offices, he does so with the united good wishes of the whole of the Company's employees, though they were precluded from giving expression to them at a general gathering owing to the largeness of their numbers. There was consequently no formal leave-taking, or anything in the nature of a testimonial. We trust there may be before Mr. Field many years of congenial and useful work in connection with the preparation of the "Analysis" with which his name is indissolubly associated, the value of which has been greatly enhanced by the extended scope he has given to it since it passed into his hands.

Apart from the retirement of Mr. Field, we understand that several changes among the various Station Engineers of the Company have been determined upon. Probably the most important is the relinquishment by Mr. W. B. Wright of the management of the Bromley station of the Company. His son, Mr. Fred. Wright, who was Assistant at Bromley, goes to Beckton, under Mr. Iago. Mr. Reeson has been transferred from Beckton to the engineership of the St. Pancras station, in place of Mr. Lacey, who in future will take charge of the Bromley works. Mr. Wright was formerly with the Imperial Company, and was one of the officers taken over on the amalgamation of that concern with the Gaslight and Coke Company.

Mr. H. M. BAIRSTOW, Assistant to Mr. J. H. Crowther, at Wallasey, has been selected to fill the position of Superintendent of the Effingham Street works of the Sheffield Gas Company.

The Gas and Electricity Committee of the Aberdeen Corporation have elected Mr. SAMUEL MILNE Engineer and Manager of the department, in succession to Mr. A. Smith, who has retired. Mr. Milne has been employed in the gas-works for twelve years; and during Mr. Smith's long absence, he carried on the duties of the office of Manager to the satisfaction of all.

Consequent upon the succession by Mr. R. BRUCE ANDERSON to the positions in connection with gas-works in Ireland vacated by his father, and his recent appointment as Engineer and General Manager of the Queenstown Gas Company, several changes have just been made by him in the management of gas-works under his supervision. Mr. W. DUNN has sent in his resignation as Manager at Queenstown, which post will be filled by Mr. JOHN PATERSON, of Tipperary, where he has been for five years, and where the management has been so satisfactory that the Company have presented him with a gold watch in recognition of his services. His place will be taken by Mr. JEREMIAH GRANT, of Fermoy. Mr. J. F. TYNDALL, now at Carrick-on-Suir, has been promoted to Mallow, and is succeeded by Mr. Dunn, who will receive the same remuneration as at Queenstown; while Mr. D. W. TOOMS will take the position at Fermoy vacated by Mr. Grant. In notifying these changes to us, Mr. Anderson remarks that the parties concerned are "a worthy set of young men whom it is a pleasure to be associated with."

THE LATE MR. THOMAS FLETCHER.

IN the last number of the "JOURNAL," we noticed the death, on Sunday, the 20th inst., of Mr. Thomas Fletcher, F.C.S., of Grappenhall, near Warrington, the Chairman of Messrs. Fletcher, Russell, and Co., Limited. It was only possible then to give a very brief account of the deceased gentleman's life-work; and therefore the following additional particulars (for much of which we are indebted to the family) may be of interest to our readers.

Mr. Fletcher was born at "Kirkhams"—an old house four miles from Manchester—in 1840. He was the youngest of a large family, the male members of which were educated for the legal or the medical profession. Mr. Thomas Fletcher attended the Manchester Grammar School; and it was intended he should become a doctor. But the work of the dissecting-room was distasteful to him; and so he turned his attention to the study of dentistry. He was first a pupil, and afterwards a partner, of Mr. Henry Planck, formerly Dean of the Dental School connected with the Victoria University, where his inventive faculties and his interest in the application of chemistry to the rarer metals were encouraged. He introduced all kinds of labour-saving appliances in which gas was the fuel employed. In the year 1872, he began to extend these experiments to apparatus for chemical and physical laboratories; and finding his efforts were successful, he retired from dental practice. The first appliance which brought his name into prominence was a very simple modification of the ordinary mouth blow-pipe, by which a strong platinum wire could be fused with ease in a candle or an ordinary lamp flame. This was followed by the invention of a small gas-furnace, adaptable for many purposes. Later, his invention of the oxygen blow-pipe caused great consternation among the safe makers. To him is due the discovery of the laws ruling the forms and proportions of burners consuming mixtures of gas and air, which has resulted in the production of the varieties now in use for the scientific and domestic application of gas as fuel.

Mr. Fletcher was a voluminous writer of papers for scientific journals. His "Dental Metallurgy," to which reference was made last week, has been translated into French, German, and Italian. His "Coal Gas as a Fuel," which has reached its fifth edition, is used as a standard text-book. As regards the popularization of coal gas as a fuel, Sir George Livesey spoke very highly of Mr. Fletcher's work when he was proposed as an honorary member of the Institution of Gas Engineers last June. He was considered an authority on this subject, and his opinion and advice were widely sought and were freely given. He was a member of several societies, and often contributed to their transactions. In addition to the papers already noticed, he read before the Society of Arts, in 1884, one on "Coal Gas as a Labour-Saving Agent in the Mechanical Trades;" in 1885 he gave a lecture before the Association of Foremen Engineers in Manchester on "Gas for Light and Heat in the Workshop;" in 1888 he read before the Society of Chemical Industry a paper on "A New Commercial Application of Oxygen," and gave a lecture on "Flame and Smoke" before the Manchester Noxious Vapours Association; and in 1890 he gave the Oxford lecture on "Flames."

The business career of Mr. Fletcher was highly successful. He commenced in 1872 with a staff of three workmen. In 1881, he erected the original works in Thynne Street, Warrington, which were abandoned on the opening of the extensive establishment at Wilderspool, referred to last week. The present Company employ more than 1000 hands in the various departments. For his productions he personally obtained fifteen gold, eight silver, and three bronze medals from societies and at exhibitions, and many others have been awarded to the Company.

Mr. Fletcher was a man of most generous disposition; his charity being widespread and unostentatious. He was a widower (Mrs. Fletcher having died in May, 1900); and he leaves two sons and two daughters. The funeral took place last Tuesday, at Grappenhall Parish Church, and was attended by a large number of friends and of the employees of the Company.

Dr. Louis Parkes has been appointed to succeed the late Professor Corfield as Consulting Sanitary Adviser to the Office of Works.

The preliminary report of the United States Geological Survey makes the total oil production of that country for 1902 80,894,590 barrels. This is the largest quantity ever known in the history of the country. The production for 1901 was 69,389,184 barrels. The gain during the past year was 11,505,406 barrels in quantity; and the increase came almost entirely from Texas and California.

Statistics prepared by the United States Census Bureau show that upwards of £100,000,000 is invested in electric light and power undertakings, which number 3619, and that the gross yearly earnings of these amounted to more than £17,000,000. The total annual expenses came to £14,000,000, of which about £4,000,000 was paid in salaries and wages. The capacity of machinery installed totalled 1,758,175-horse power, of which 381,134-horse power was generated by 1378 turbines, and the remainder by 5921 steam-engines. The total output for the year in kilowatt-hours was 2,437,218,732.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 821.)

LAST week saw a further heavy depreciation on the Stock Exchange, under continued realizations, and the absence of buying orders. The persistent selling of stocks not unnaturally gives rise to ideas of impending financial trouble; but this is not feared in good quarters. The continued weakness of Consols, which touched 88 during the week, had a sentimental influence on the more speculative securities; and, with the exception of Foreign stocks, the changes in all departments have been in the downward direction. The weakness, however, was partly due to the liquidation of a deceased account; but dear money has played a more important part, for it has forced out stocks which have been held with borrowed money on margins. There was no rise in the Bank Rate, as some anticipated; but money and discount rates are likely to be well maintained for some weeks. In the Gas Market, there was more doing, though on the whole the market was quiet, but dull in tone. Moderate transactions were recorded in Gaslight and Coke ordinary; but as the sales predominated, the stock fell 2 points, to 83-85. The secured issues were quiet, but firm; the 4 per cent. preference being quoted 103-106. There have been more dealings in South Metropolitan than in the previous week, business being done in the early days at 119¾; but the price subsequently gave way, and closed at 115-118—exceptional dealings being recorded at 117. The fall amounts to 3½. Commercials were dealt in at 105½ and 107; the price remaining unaltered. Among the Suburban and Provincial group, there were also some declines. Liverpool "A" declined 1, to 214-216; and Newcastle and Gateshead debentures are easier at 98-99. On the other hand, Newcastle ordinary stock improved ½, to 103½-104½. There was also some inquiry made for Alliance and Dublin 10 per cent., which are quoted ½ up, at 19½-20½. In the Continental Companies, there was also some weakness. Continental Union 7 per cent. preference fell 2, to 135-140, and Imperial Continental 4, to 195-200. British Gaslight was also easier at 39-40. In the Foreign Companies, San Paulo fell ½, to 11-12. River Plate ordinary were supported in the early part of the week, and rose ¼; but the advance was not maintained, and the price remains unchanged at 11¼-11¾. Water stocks were not much dealt in; and no change whatever was recorded throughout the week.

The daily operations were: In Gas, business was very quiet on Monday; very few dealings being recorded. South Metropolitan ordinary fell 1, and San Paulo ½. Tuesday was even a quieter day; the only alteration being a rise of ¼ in River Plate ordinary. The official record of business on Wednesday was small; but there were more changes in quotations. South Metropolitan fell 1, and British Gas ½; while Alliance and Dublin rose ½. There was further weakness on Thursday. Continental Union fell 2, Gaslight ordinary 1, and River Plate ¼. On Friday, Imperial Continental fell 1½, and South Metropolitan ½. There was renewed depression on Saturday. Gaslight ordinary again fell 1, Imperial Continental 2, and South Metropolitan 1. There are no changes to record in Water stocks.

THE GAS-FIRE SEASON.

THE season has now arrived when we are called upon to notice the new designs and improvements which the makers of gas-fires have been producing during the summer months for the ensuing winter. These descriptions are published as much in the interests of gas undertakings as in those of the manufactures themselves, because the gas-fire business offers plenty of scope for the development of gas consumption. The difficulty is to obtain something that is altogether new in this line. What the makers present from year to year is merely the old improved in certain details. But these improvements are not by any means of an order to be treated with contempt. In recent years, we have seen the exteriors of stoves bettered and varied in design and finish to make them serviceable in rooms of all descriptions and suitable for harmonizing with any form of decoration; we have seen advances made in increasing the efficiency of the fires, and in facilitating the removal of the burners for cleaning; we have seen, too, the useful and highly efficient little register fires introduced; and in other types there have been touches here and there which have brought about increased merit. In other words, although there has been no revolution in gas-fire production, the makers have not been supine.

The first to bring some fresh improvements to notice this year are the Richmond Gas Stove and Meter Company, Limited, and after inspecting their new and revised designs of gas fires and heaters, it must be said that the firm continue to exhibit the vigour and insight which so rapidly won for them a place in the foremost rank of enterprising manufacturing concerns, and that, although they were so suddenly deprived of their leader a year ago, the energetic and practical working staff he had drawn round the concern have the power to retain and enhance the reputation which had been acquired under his personal direction. Their intention to keep in the van of progress with every sort of heating and cooking appliance is traced in the number of patterns of gas-fires—new and reconstructed—which are now being put forward by them. We are reminded that the Company have at all times recognized that the popularity of gas-stoves both for cooking and heating purposes must depend largely on the easy facilities that are afforded by gas companies and corporations for them to be had at small rentals, or free with the slot meter; and they have therefore paid special attention to construction to secure economy in outlay and in maintenance. "All parts removable for cleaning and repair" are words that have long been used in connection with their cookers. The same words can now be applied to their gas-fires.

One of the improvements appeals to us very strongly. Time was when it was quite a job for a gas-fitter to clean out a gas-fire suffering from a choked burner. It generally meant the removal of the fire, or else the occupation of a room for an hour while he disconnected the fire, removed the fireclay balls, and then the burner—the while scattering dust over everything near. Attention was gradually turned to devising a method for accomplishing the removal of the burners without all this fuss. There has been a gradual success, until now the difficulty is to see how the latest method in the Richmond fires is to be surpassed. The fuel is held in a basket above the burner, so that this has not to be removed when the burner gives evidence of its desire to be cleaned. The fender is hinged on one side, and kept in place by a thumb-screw on the other. Remove this thumb-screw, throw back the fender, and the burner can be drawn out without any disconnecting whatever. Turn the burner upside down, and

"RICHMOND."

Showing the Swing Fender Open.

blow through it; and the whole process of cleaning is finished. Anybody can do this; and the ordinary efficiency of the fire can be easily restored in thirty seconds. Reverting to the slight elevation of the fuel above the burners, it is claimed that this permits perfect combustion of the mixture to take place before the flames impinge on the fuel, and that the flames are not broken up by obstructions too near the nipples—the result being a far higher duty. Much time has also been spent in trying to secure a better material for the bricks and fuel. The Company believe they have succeeded in this. The material which they now obtain is softer, and not so liable to crack through contraction after the fire has been in use. It is credited, too, with having a very high radiant and low conducting power, which assists in maintaining the brightness of the front of the fire. The fire-brick is also curved at the upper part towards the front of the fire, and this has the effect of throwing the heat outwards and downwards. Whether one or other of these improvements is the main cause, or whether it is their combination that has produced it, need not be said; but that the Company have greatly advanced the efficiency of their fires there is not the slightest doubt. Among smaller changes, but important in their respective objects, may be mentioned that the flue-outlets are made circular and to standard sizes according to the size of the fires. This will be much appreciated by purchasers. The backs, too, are made so that they will fix flush against the fireplace, or in any other position that they are required for. Every fire, too, is now fitted with a water-gas attachment which can be easily regulated from the front of the fire without disconnecting. It is also useful for regulating the supply of gas where the pressures are above the normal.

This generally describes the improvements in the Company's ordinary fires; and they will be found incorporated in the remodelled "Richmond" and Gordon series of fires, to which have been added new sizes. In condensing-stoves, the "Cambridge" is new. It is fitted with ornamental cast-iron radiator tubes on each side of the combustion chamber, which, it is claimed, gives "a more effective radiation, and a larger quantity of condensed products of production." However, we are assured that the average daily tests of this condenser show a larger proportion of arrested products than has yet been found possible. If so, it is an advance worth noting. This particular stove is very suitable for halls and narrow places where little room can be spared. There is a swing flap provided at the top of the chimney for igniting the specially made argand burner. The pan underneath for catching the condensation is coated with "Porcellanite" enamel; and this is found to be preferable to pans of plain copper or other material. Another condensing-stove worthy of notice is the "Guildhall" radiator, which has an appearance and effect similar to the extensively used hot-water radiator, but not requiring a central heating arrangement, or a costly system of services. All that is needed is a simple gas connection; and any one, in any position, is ready for immediate use. The tubes have one bolt running through the lot, and are screwed together and clamped with special material which prevents any possibility of leakage. A new design of white light reflector stove is the "Midland," which is embellished with coloured glass panels, and has a greatly improved copper reflector. The "Reform" register fire is for use in existing fire-places; and the Company are recommending this as being particularly suitable for hiring-out purposes—one pattern, in varying sizes, being applicable almost to any grate. A good front of fuel is presented by these fires.

The Company are firmly convinced that the hiring out of gas-fires will have to be taken up more freely by gas undertakings than it has been; and it will be seen, from what has been stated, that they are preparing themselves with fires specially suitable for the purpose. In connection with the slot system, too, experience has proved that, in the houses of the better class of prepayment consumers, a small fire is very advantageous to the gas suppliers. Of a fire called the "Maidstone," the Maidstone Gas Company have several hundreds fixed in slot consumers' houses. The fire is an 8-inch one, the consumption lower than in the other types of fires, and a boiling-burner is fixed on the top. The Richmond Company have this season succeeded in excelling their previous performances in the gas-fire department.

New Roofing Material.—The current number of "Le Gaz" contains a description of a new roofing material which is on view at a Building Exhibition at the Grand Palais in Paris. It is made up in the form of slates 16 inches square and about one-eighth of an inch thick; and it is stated to stand rough handling and to be very durable. It may be applied advantageously for roofing purifier-houses, as it is not only as light a covering as corrugated galvanized iron (weighing only about 2 lbs. per square foot), but is superior to that material in being unaffected by the fumes arising from the boxes.

Gas-Engines for Central Electric Light Stations.—Writing in the "Electrical Times," an advocate for gas-engines for central stations for generating electricity gives the following as their chief advantages compared with steam-engines: (1) Extremely low coal consumption; (2) rapidity with which sudden demands for power can be met; (3) small outlay on buildings, and ease with which extensions can be carried out to existing generating stations; and (4) simplicity and reliability. Taking as an example an average size of central station situated in or around London, generating 3 million units per annum, the respective costs of the fuel bills would, he says, be as follows: Steam-driven plant, average fuel consumption 6 lbs. per unit generated, with coal at 21s. per ton delivered, total cost of fuel £8436; gas-driven plant, average fuel consumption 2 lbs. per unit generated, with coal at 12s. 6d. per ton delivered, total cost of fuel £1674—showing a saving in the fuel consumption of a gas-driven station as against that of a steam-driven station of no less than £6762.

Carburetted Water-Gas Tar for Boiler-Heating.—During the visit to the Brentford Gas Company's works of which an account is given in this issue, it was noticed that one of the boilers at the Southall station has been fitted with four burners on the Hydroleum Company's system for the burning of the tar produced in the manufacture of carburetted water gas. The boiler is of Lancashire type, 7 ft. 6 in. diameter, and 28 ft. 6 in. long. About 1200 gallons of the tar are used per day; and this quantity generates sufficient steam for the production of about 1,400,000 cubic feet of water gas, and to meet the requirements of the engines and pumps. The water is not separated from the tar; it is used direct without treatment of any kind. With the boiler working in this manner, a pressure of 120 lbs. can be obtained in about two hours, starting with cold water, whereas, working on the ordinary system, it would take something like twelve hours to get up to full pressure. Nothing could be detected coming from the chimney; and Mr. James Husband, the Company's Chief Engineer, stated that, after twelve months' experience of the system, he can say that it works admirably, and that there is no effect on the interior of the furnace. The boiler is examined periodically by the National Boiler Insurance Company. This experience is worth having.

TECHNICAL RECORD.

THE DELLWIK WATER-GAS PROCESS.

An American Controversy.

It will be remembered that in the "JOURNAL" for May 5 last, we commenced the publication of an interesting report, prepared by Mr. Irvin Butterworth, for presentation to the Ohio Gaslight Association, on "The Progress of the Gas Industry." In the course of the report, the following statement was made:—

> The Dellwik process of water-gas manufacture, introduced within the past five years, has for some reason been tried only experimentally in this country, not having been regularly adopted, so far as I know, in any plant. But in England, and more especially in Germany, the method is gaining headway, and promises much for economy in water-gas manufacture. Under this process, which increases the velocity of the air-blast when blowing up the generator fuel to incandescence, the carbonic acid does not have time to decompose to carbonic oxide; and thus a much greater proportion of heat than with the ordinary process is imparted to the fuel bed, where it is needed, instead of being sent forward to the carburettor or superheater, where so much heat is not wanted; and thus a great waste of heat is prevented. The capacity of the apparatus is also thereby increased, which means a saving in cost of labour and in radiation of heat from the apparatus. A prominent American gas engineer writes me as follows: "The Dellwik process, to my mind, is a fundamental discovery in gas making. But it seems hardly fair to regard it merely as a discovery in gas making, for it will have even a greater influence in fuel economics and other industries than in the gas business. The discovery of this process is certainly more important, in my opinion, than any other discovery since the invention of the Lowe machine."

This statement has given rise to a triangular correspondence—the three gentlemen concerned being Mr. Butterworth, Mr. Henry L. Doherty, and Dr. Alex. C. Humphreys (of Messrs. Humphreys and Glasgow). Permission has been given for the publication of the letters in the "JOURNAL" and the American papers which printed Mr. Butterworth's statement; Mr. Doherty reserving the right to reply further. The introductory letters with which the controversy opened contain nothing of public interest.

THE CORRESPONDENCE.

(I.)

Denver, Colo., July 7, 1903.

Mr. A. C. HUMPHREYS, 31, Nassau St., New York City.

Dear Mr. Humphreys,—Referring again to your letter of May 6, I will now say that, as you may have surmised, the "prominent American gas engineer" to whom I referred in my "Progress Report," read at the meeting of the Ohio Gaslight Association,* and whose letter to me on the subject of the Dellwik process I quoted in part in such report, is Mr. Henry L. Doherty.

I took the liberty of showing your letter to Mr. Doherty, and requested a memorandum from him defending his position in the light of the criticisms contained in your letter. I herewith enclose copy of note to me on the subject.

I know that you and Mr. Doherty are both seeking simply the truth in matters of this kind; and I am sure that he would greatly appreciate any further discussion which you may feel disposed to send me relative to the claims made by him with reference to the originality and value of the Dellwik process.

(Signed) IRVIN BUTTERWORTH.

(II.)

Denver, Colo., July 3, 1903.

Mr. BUTTERWORTH.

Your note of May 10 (pinned to Mr. Humphreys' letter) was misplaced; but I have since found the letter from Mr. Humphreys, which you requested me to return to you.

I note what Mr. Humphreys says, and am sorry to be compelled to disagree with such an eminent authority; but, by inference, Mr. Humphreys puts me in the light of claiming more for the Dellwik process than Dellwik himself claims.

I still maintain that the Dellwik process resulted in a fundamental discovery in gas making. Results obtained in the Dellwik process can be obtained in any sort of a shell, provided sufficient blast velocity through the fuel beds can be maintained; but if anybody ever demonstrated that more than 90 per cent. of the carbon could be taken away from the top of the fuel in the form of carbonic acid, I failed to see an announcement of such discovery previous to the announcement made regarding the Dellwik process.

I think the theory of the Dellwik process is this: That by high blast velocities the time contact between a given molecule of carbonic acid and a given atom of carbon is too short to secure decomposition of the carbonic acid.

If this theory was announced prior to the work of Mr. Dellwik, I failed to see such theory put in print; and I would be glad to know where I can find it stated, and who deserves the credit for the evolution of this theory. I hold that it is not true that Mr. Glasgow pointed this out "very completely" in his paper read before the American Association. Mr. Glasgow simply observed

* See "JOURNAL," May 5, 1903, p. 292.

that the production of carbonic acid was increased by a high blast pressure; but he did not demonstrate or claim that practically all of the carbon could be taken out with a high blast in the form of carbonic acid, neither did he evolve the theory stated above, which is very useful, not only to gas engineers, but to all fuel engineers.

If there is a standard water-gas machine in this country that will permit the securement of results such as have been secured in the apparatus built by Dellwik, and with the necessity for no greater radiation loss, or the necessity for no greater application of power, I will admit that there is some just cause for complaint in Mr. Humphreys' letter.

If there is nothing new in the Dellwik process, my position in this matter puts me in a class which evidently makes Mr. Humphreys very weary. I am perfectly willing to retract my statement if Mr. Humphreys can prove to me I am wrong; but I think the responsibility rests on him to prove that there is nothing in the Dellwik process, for the Dellwik process certainly has secured results that have never been secured prior to the time the results of the Dellwik process were announced.

If the theory of the Dellwik process is something old, Mr. Humphreys can undoubtedly tell me where the concise statement of this theory can be found.

(Signed) HENRY L. DOHERTY.

(III.)

38, *Victoria Street, London, S.W.*,
Aug. 26, 1903.

IRWIN BUTTERWORTH, ESQ.

Dear Mr. Butterworth,—Your letter of the 7th of July, replying to my letter wherein I criticized that part of your official "Progress Report" to the Ohio Gaslight Association in which you endorsed the claims of novelty and discovery made on behalf of the Dellwik process, has been forwarded to me here.

I really did not know what "prominent American gas engineer" you were quoting; but one thing I was convinced of—namely, that he was not informed as to the evolution of water gas and what is technically known as the "State of the Art." The memorandum from this gentleman, which you enclosed in your letter, confirms me in the opinion I first formed as to his knowledge of the subject. If I remember correctly, he was not directly interested in water gas until after many steps in its evolution had been taken. It is, therefore, not surprising tha accepted features in efficient water-gas practice, evolved through years of commercial operation, should have missed his attention until he was attracted by Mr. Dellwik's claim for novelty.

As I understand it, your endorsement of the Dellwik claims is practically based upon the opinions of this "prominent American gas engineer." I will, therefore, now consider in some detail his memorandum which you have kindly forwarded to me. I shall hereafter refer to your correspondent's communication as the "memo."

The first thing which strikes me is that your correspondent does not offer, in answer to my request, any evidence in support of his contention, but is apparently satisfied to re-assert his opinions, and to support his claims solely by asking me to disprove them.

I quote from the "memo.": "I still maintain that the Dellwik process resulted in a fundamental discovery in gas making. Results obtained in the Dellwik process can be obtained in any sort of a shell, provided sufficient blast velocity through the fuel beds can be maintained; but if anyone ever demonstrated that more than 90 per cent. of the carbon could be taken away from the top of the fuel in the form of carbonic acid, I failed to see an announcement of such discovery previous to the announcement made regarding the Dellwik process."

This is not very clear, nor very convincing. Few well-known features of manufacture in the several industries have ever been specifically announced; and possibly in the case of some that have been announced, most of us have failed to see the announcement. It is safe to say that in a majority of the patent cases which reach the Courts, no such specific announcement defining the state of the art is available as evidence. In many cases the written record of the state of the art is then made up for the first time.

But though no sensational "announcements" may have been made of its progressive steps, the routine records of those responsible for water-gas evolution will abundantly show that their practical progress was throughout directed by an intimate knowledge of the theory of deep-fuel combustion, now claimed as a "fundamental discovery" of Mr. Dellwik. For instance, I quote from the earliest record to which I have access at the moment, being Mr. Glasgow's letters to the Engineer-in-Charge of the *first plant* constructed by our London office:—

"April 4, 1893. Are we not producing more carbonic oxide in the generator than we are able to burn advantageously in the carburettor and superheater? This must be the case, or we could not have so high a fuel consumption. The *remedy is, of course, to blast harder and quicker.* That means that we must speed up the blower."

"May 13, 1893, We should run with the full depth of the fuel bed, but with a very hard short blast—in this way reducing the energy sent forward into the fixing-chambers, but at the same time retaining the full duty of the fuel bed for the conversion of steam."

Progress is made through evolution; "fundamental discoveries" are very rare. I think your correspondent would find it difficult to prepare a considerable list of "fundamental discoveries" in the gas business, if he went back to the time of Murdoch. Even Lowe's invention was not a "fundamental discovery," but simply the combination of well-known principles which had been practised separately.

Long before the time when water gas was commercially produced, the control of the quantity of carbonic acid was well known to be dependent upon the velocity of the air through the fuel-bed. This point is at the very foundation of carburetted water-gas development; but your correspondent, like some others, apparently fails to appreciate that the carburetted water-gas engineer was restrained from going to the limit in minimizing the percentage of carbonic acid in the generator blast gases, by reason of his process requiring the production of carbonic oxide for the economical simultaneous gasification of the enriching oil. By trial and error, it was learned that much less carbonic oxide was required for the heating of the fixing-chambers than was first allotted to that purpose; so gradually the pressure of blast was increased, and the length of blow diminished, until a balance was reached for the particular quality of gas desired.

If your correspondent will read Mr. Glasgow's paper, read in 1893 before the Incorporated Institution of Gas Engineers (see "JOURNAL OF GAS LIGHTING," Vol. LXI., p. 874), he will find that Glasgow there explained that by modifying the pressure and length of the blast with relation to the depth of fuel, the relative proportion of carbon burned in the generator to carbonic oxide and carbonic acid could be modified at will. This was referred to as a "modification," because the process he was explaining required a certain amount of carbonic oxide to be burned in the fixing-chambers. But surely a knowledge of generating conditions which permitted of the exact balance between carbonic oxide produced (in the blast gases) and carbonic oxide required for the gasification of the oil, whatever the quality of the gas, leaves no room for the term "fundamental discovery" as applied to Mr. Dellwik's crude patent claims for simple blue-gas manufacture?

The veteran Gas Chemist, Mr. W. Young—inventor of the "Peebles" oil-gas process, with which the Dellwik "process" has been somewhat identified—in a paper read before the recent meeting of the North British Association of Gas Managers,* frankly acknowledges that Dellwik cannot claim the discovery of this principle to which your correspondent refers. Mr. Young says: "After drawing attention to the principles involved in the production of water gas by the Dellwik and Lowe processes, and showing that the principle of utilizing the largest possible heat-energy of the carbon of the coke by burning it to carbon dioxide during the blow period had been first used in the Dellwik process, I showed that the principle was not new, but that it was well known and had been for a long time recognized and applied in the working of the Lowe process by Messrs. Humphreys and Glasgow."

Mr. Glasgow certainly does not claim to have evolved what your correspondent calls the "theory of the Dellwik process"—namely (quoting from the "memo."), "That by high blast velocities the time of contact between a given molecule of carbonic acid and a given atom of carbon is too short to secure a decomposition of the carbonic acid."

On the contrary, I can say that this "theory" was common knowledge long before Glasgow began to study the chemistry of gas making. In his paper of 1890, Glasgow simply emphasized the necessity of putting this knowledge into practice, if good generating results were desired. I instanced this paper, when first writing to you, because it begins with the concise and matter-of-fact expression of the principles, then fully understood by those skilled in the art-principles which govern all economical water-gas practice—whether Lowe or Dellwik.

Your correspondent implies that Mr. Dellwik's "fundamental discovery" was that "more than 90 per cent. of the carbon could be taken away from the top of the fuel in the form of carbonic acid. But the Dellwik patent claim is the operation of a water-gas generator so that "the blast products contain more carbonic acid than carbonic oxide." That means so that 40 per cent. of the blast carbon be "taken away from the top of the fuel in the form of carbonic acid."

But these percentages, however differing, are not material; for it is, of course, easily possible to take away any desired proportion of the blast carbon in the form of carbonic acid, provided the length and strength of the blast, and temperature, and depth of fuel bed be adjusted to that end. The economy of such adjustment, however, is influenced by the percentage of carbonic acid permissible in the water gas and the make obtainable from the plant; and in the case of carburetted water gas, by the fact that the blast products must contain the necessary energy for gasifying the enriching oil.

In my connection with the development of water-gas manufacture, I have seen the standard Lowe generating conditions change from a blast-period of 30 minutes to a blast-period of 2 minutes (for say 16-candle gas), with corresponding decrease in blast carbonic oxide. Yet no valid claim of "fundamental discovery" or patent rights could possibly attach to such a practical evolution under well-known guiding principles. Consequently, no generally advertised "announcement" has been made of the numerous progressive steps in this evolution, any

* See "JOURNAL" for Aug. 4, 1903, p. 298.

more than of the changes from a pressure little above that of the atmosphere to, say, 300 lbs. per square inch, in the case of steam engineering.

Likewise, when Mr. Dellwik adopts the Lowe generator conditions, *without the fixing-chambers*, and is obliged to shorten his blast-period correspondingly for "blue" gas, his work is not fitly described as the "greatest discovery since the Lowe process." It was merely a limitation of well-known practices to a single purpose.

I quote again from your correspondent's "memo.": "If there is a standard water-gas machine in this country that will permit the securement of results such as have been secured in the apparatus built by Dellwik, and with the necessity for no greater radiation loss, or the necessity for no greater application of power, I will admit that there is some just cause for complaint in Mr. Humphreys' letter." And in his third paragraph, which I have already quoted, he says: "Results obtained in the Dellwik process can be obtained in any sort of a shell, provided sufficient blast velocity through the fuel beds can be maintained. . . ."

The above quotations again evidence that your correspondent has failed to grasp the subject, and consequently begs the whole question in his conclusion.

In the ordinary working of the Lowe process, the fixing-chambers necessarily present resistance to the blast, and involve radiation; but they also perform highly important manufacturing functions over and beyond the production of "blue" gas.

When the *only* product required is blue water gas, the conditions become very simple. The fixing-chambers being abandoned, the mere elimination of their back-pressure (without other change) more than doubles the generator blast-head. The corresponding and necessary reduction in the length of blast (both for economical reasons and to prevent the plant being burned out) gives us the so-called Dellwik process—*i.e.*, ordinary carburetted water-gas practice simplified for, and restricted to, the exclusive manufacture of blue water gas.

But responsible water-gas engineers must cover a broader field than that. Blue water-gas manufacture forms but the foundation of our work.

I hope I may claim some knowledge of the situation; but I am unable to discover in blue water-gas manufacture any general economic value to a company engaged in the distribution of town gas, and I consequently see no room on a gas-works for apparatus that can produce only blue gas.

Speaking for my own firm, I may say that the only water-gas plant we will recommend to others, or utilize in our own practice as gas distributors, must be capable—by adjustment of back-pressure, but without structural change—of making carburetted water gas of any practical quality, or blue water gas if desired, with an efficiency at least unexcelled by any known blue-gas generator.

I again quote from your correspondent's "memo.": "I am perfectly willing to retract my statement if Mr. Humphreys can prove I am wrong; but I think the responsibility rests on him to prove that there is nothing in the Dellwik process, for the Dellwik process certainly has secured results that have never been secured prior to the time the results of the Dellwik process were announced."

As I cannot admit your correspondent's conclusions, neither can I admit that the burden of proof rests on me. Your correspondent—occupying a position of importance and influence in the gas industry—has assumed the responsibility of asserting that the so-called Dellwik process contains a "fundamental discovery." This in the face of the statements of engineers of repute, who have practically devoted their lives to this subject, to the effect that they had understood and practised the principles claimed as the Dellwik "discovery" for years before they ever heard of Dellwik. No, the proof rests upon your correspondent and your good self—if this letter does not satisfy you.

But as to results. The drawing of a comparison between blue gas and carburetted water gas, by deducting the volume of the oil gas contained in the carburetted water-gas mixture without making allowances for the carbonic oxide burned to carbonic acid in the fixing-chambers in the useful work of producing this oil gas, is, of course, ridiculous. Nevertheless, this is the method persisted in by Mr. Dellwik and his associates. Indeed, we have even seen this method extended to the comparing of the consumption of "carbon" during special brief tests of the Dellwik generator with the consumption of gross coke (including moisture)—increased by one-third, to *compensate* for oil-gas volume—over extended periods of intermittent working of a Lowe carburetted water-gas generator.

But it will do more harm to see where such a method of comparison brings us, *provided its fallacy is kept fully in mind.*

In the publications (elsewhere referred to) advocating Dellwik blue water gas at Ilford—and greatly understating its cost—the consumption of generator fuel for six months was given as 36 lbs. per 1000 cubic feet. The returns of the Brighton Gas Company from carburetted water-gas plant constructed in 1895, averaged, for the three years 1896, 1897, and 1898, 27·6 lbs. generator fuel per 1000 cubic feet of carburetted water gas. This carburetted water gas averaged probably 22 to 25 per cent. oil gas. Consequently, if the whole of the generator fuel were charged against the (say) 77 per cent. of blue water gas, the fuel consumption would be 36 lbs. per 1000 cubic feet of blue gas produced—exactly the Ilford figure, although no credit is taken for the useful work of gasifying the enriching oil nor for the waste inseparable from that additional and important manufacturing operation.

It seems evident, therefore, that apparatus had been installed, *prior to the introduction of the Dellwik generator*, having a fuel economy unequalled by Dellwik plant of present construction; while modern-form Lowe plant can be found regularly working with less than 30 lbs. gross generator coke, where the volume of oil gas does not exceed 15 to 18 per cent. of the finished gas.

To reverse the comparison, you can see what results the Dellwik generator yields in the production of illuminating gas, in combination with some enriching process, from the brief analysis of the Cleethorpes results as given in Mr. Glasgow's article "Blue Water Gas at Ilford and Elsewhere" ("Journal of Gas Lighting," April 14, 1903). This particular reference appears in Section III. of the article. Here the Dellwik generator is backed up by as good a system of oil retorting as can be found—the "Peebles" process of Mr. W. Young. An analysis of the figures given by the Dellwik-Peebles advocates shows that 32½ lbs. of coke were required for the generator alone, in the manufacture of blue gas, *per 1000 cubic feet of the mixed carburetted water gas.* The Humphreys-Glasgow apparatus in regular working in many works will average better than this, and its fuel expenditure covers the converting of the oil into gas, which in the Cleethorpes instance required an additional 13½ lbs. per 1000 cubic feet of 18-candle gas.

I would finally recommend your correspondent, if he really wishes to understand this question in all its bearings (as I believe he does), to study—not simply read—the articles, correspondence, papers, discussions of papers, and editorial comments which have lately appeared in the (English) "Journal of Gas Lighting," beginning with an article by one of the Journal's Editors, which appeared in the issue of the 30th of December, 1902, and continued to the last issue.

Mr. Glasgow therein has easily disposed of the unjustified and unjustifiable Dellwik claims; and if your correspondent will study all that appears on both sides in this controversy, I have but little doubt that he will be ready to acknowledge that in endorsing the Dellwik "process" he has done what we all have done in our busy lives—spoken too hastily.

After all, it comes back to the question, Did we who were really skilled in water-gas manufacture understand this relationship between blast pressure and proportions of carbonic oxide and carbonic acid in the blast products before Dellwik attempted to claim as his "discovery" the results of many years of labour of a number of earnest workers?

There can be but one answer, from whatever standpoint the view.

(Signed) Alex. C. Humphreys.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The members of the above-named Association opened their winter session on Saturday, when a meeting was held in one of the class rooms of the Municipal School of Technology, Manchester. Mr. S. E. Halliwell, of Littleborough, the President was in the chair. There was a good attendance of members.

The President, in opening the proceedings, said they were fortunate in having secured for their first meeting a paper by Mr. Harold Smith, of the Bury Corporation Gas-Works, on "Tar Distillation"—a subject with which many of them were not too well conversant. He would at once call upon Mr. Smith to read his paper.

Mr. Harold Smith then read the following paper:—

THE DISTILLATION OF COAL TAR.

Having been urgently requested by the Council and other members of this Association to give a paper on the "Distillation of Coal Tar," I thought that the best thing to do would be to give, in as concise a manner as possible, a description of the process involved in the extraction of the crude products, with just a brief mention of their principal uses.

The first thing essential in the distillation of tar is to get the tar as free as possible from water or ammoniacal liquor. As you are aware, the tar and liquor produced on a gas-works are generally run together into one large well, in which they separate by standing, owing to the difference in the specific gravities. This, however, does not clear the tar of all the liquor, as very often much of it is held in suspension by the tar. There are several methods and inventions for the dehydration of tar. I find, however, that gently heating it in a cistern by means of a steam-coil is as simple and efficient a plan as any for this purpose. By this means, the small globules of tar holding the water are burst, and the water rises to the top and is carried away by an overflow pipe. It must not be taken, however, that the tar is now completely free from water; for, as will be seen later, a further portion is given up on distilling. This portion seems to be part and parcel of the tar itself.

The tar is now run from the cistern into the still to within from 2 to 4 feet of the top of the dome, according to the size and shape of the still. This space is to allow sufficient room for the swelling of the tar when the temperature rises. After the still

is filled to the required depth and all the openings closed, the firing is commenced. A fairly good heat may be kept under the still until there begin to be signs of first distillate approaching. These signs generally consist of a little steam at the end of the condensing worm, and strong odours of ammonia. Now is the time for slackening the fire, and the firing needs to be done very cautiously, or sudden boiling over will result. Should any water have been allowed to enter the still, it will cause violent bumping, and will almost certainly result in a boil over, unless the firing is done very slowly; and if by this means the boil over is prevented, the upper part of the still is blackened by the jumping, and the distillates become much discoloured. The operation will also be greatly prolonged; hence the necessity for having the tar as free from water as possible.

The first distillate begins to flow over when the temperature has reached about 100° C., and consists of crude naphtha and ammoniacal liquor. At first, there is much ammoniacal liquor and little naphtha. As the distillation continues, the percentage of ammoniacal liquor decreases, and that of the naphtha increases, as may be seen by catching a small sample in a glass cylinder from time to time; the naphtha readily floating on the top of the water. After a time, only a small quantity of water comes over; and it will have changed from a yellow to a bright red colour. At this point, the distillation slackens considerably, and scarcely anything but a small amount of water is given off. This stage is called the break; and the change may be taken as a sign for an approaching change in the distillate. The best method of ascertaining the proper time for changing the receivers is to collect a small sample in the glass cylinder and test for the specific gravity by means of the hydrometer. When the specific gravity reaches about 950-960 at 60° Fahr., the receiver should be changed. At some works, the thermometer is placed in the still, and the change ascertained according to the temperature; the temperature at which the first change is made being about 105° to 110° C. But different distillers give different temperatures; and it seems to be a somewhat uncertain method. The difference may, however, be accounted for by the difference in the position of the thermometer in the still—some passing to a greater depth than others. The ammoniacal liquor and the crude naphtha in the first distillate may be collected in the same tank, and the water afterwards run or pumped off and worked up with the other liquor.

The second distillate is light oil, which is given off very slowly at the commencement, during which time a peculiar noise may be heard in the still, which is generally call the "rattles." The temperature has to be increased somewhat before the light oil is given off freely; and the firing may now be done without further risk of having a boil over. As the temperature increases, the last traces of water are driven out of the tar, some of which becomes condensed in the upper part of the still, and falls back and is suddenly revaporized, causing this rattling noise. When the temperature has risen to about 160° to 170° C., the distillate comes over in a pretty good stream. This fraction is allowed to flow over without any changing in the receiver, until the specific gravity is about 1000, or the same as that of water. Another method (and the one most frequently adopted) is to allow a few drops of the distillate to fall on a cold surface, such as a piece of cold iron, or on water. If the distillate solidifies, this will indicate the time for again changing the receiver. The water in the condensing tank should be kept cold up to this point—or at least until the light oil is fairly coming over, when it may be gradually increased. The temperature of the distillate is generally sufficient to do this without employing any other means.

The third distillate will consist of creosote oil, with a large proportion of naphthalene. In fact, the first part will be nearly all crude naphthalene, which will set in a solid mass on cooling. After some time, this ceases, and the remainder is almost all liquid. The next change is made when the distillate has attained a specific gravity of about 10° to 12° Twaddel's hydrometer at 60° Fahr.

The next and last fraction is crude anthracene. At this stage, the fire is withdrawn, and steam injected into the still by means of a pipe passing to within 2 or 3 inches of the bottom of the still. As the boiling-point of anthracene is 360° C., it is quite obvious that, if the firing was continued, a terrific heat would have to be used in order to drive over the anthracene, as not only would sufficient heat be required to bring up the remaining contents of the still to this temperature, but to maintain the upper part of the still at nearly the same heat. Otherwise the bulk of the anthracene vapour would become condensed before reaching the condensing worm, and fall back into the still. The rate of flow of the small portion finding its way into the condensing worm, would probably choke up the pipes, and the consequence be very disastrous; for if the still was not provided with safety-valves, an explosion might take place. Nearly all explosions of tar-stills that have occurred may be assigned to the choking up of the worm, and the still not being provided with a safety-valve.

Another reason for not using fire up to the finish is that, with the great amount of heat that would be required, the pitch at the bottom of the still would become coked and burned on to the bottom plates in a thick hard crust, thereby damaging them and requiring more fuel for every subsequent working. It will be quite obvious that, by the use of steam, these difficulties will be overcome. The anthracene vapours are carried over by the steam at a quick rate; and the whole contents of the still will be constantly agitated, preventing any coking of the pitch. When the distillate reaches a specific gravity equal to from 18° to 22° Twaddel at 60° Fahr. (according to the quality of pitch required), the steam is shut off. If hard pitch is needed, the steam is applied until the specific gravity equals 24° Twaddel, or with some tar 26°. If the distillation be carried on too long, the pitch becomes coked and honeycombed, and is then unsaleable; or, in the worst case, it refuses to run out, and has to be hacked out, causing much damage to the still. It is necessary to allow the pitch—which is the residue remaining in the still—to cool for a few hours before running into the pitch-cooler. It is then left in the cooler for about six or eight hours, until the vapour has all condensed; and then it is run into the open pitch-beds, where it is left to solidify, and has afterwards to be hacked out with picks and wedges.

The time required for the working of one charge will, of course, depend on the size of the still. From 15 or 20 ton stills are a convenient size, especially when worked day and night, and may easily be worked off in the 24 hours. Some distillers prefer 9 or 10 ton stills, as they may be worked off in the daytime and emptied and refilled during the night. Any nuisance which might arise from the running off of the pitch from the cooler to the beds, would not be as objectionable during the night as the day. Many attempts have been made at continuous distillations of tar, but with little or no success. I believe the only continuous method at present in vogue is the Lennard system. As to its merits or demerits, I am unable to speak, for as yet I have not had the pleasure of seeing it.

The receivers and storage tanks are generally old steam-boiler shells, with the ends made up. They are sometimes placed on brick pillars; while at other works they are put underground. Each system has its advantages and disadvantages. With the tanks above ground, any leakage that may occur can be readily detected and loss prevented. The contents of the tanks can be more easily drawn off than with underground ones, from which they must all be pumped. The disadvantages of the tanks above ground are the occupying of ground-space and the time and trouble spent in the use of ladders.

The principal uses of the aforementioned distillates are as follows: The crude naphtha is redistilled and split up into benzol, which is now greatly employed for gas enrichment and other purposes. Solvent naphtha is used in the rubber manufactories and for the making of mackintosh goods, owing to its property of dissolving india-rubber, from whence it derives its name; also for burning in lamps, the residue being run with the creosote. The light oil is washed with caustic soda and sulphuric acid for the extraction of carbolic acid, which is sold in the crude state or further rectified, and is largely used in the manufacture of disinfectants and soaps, and for making picric acid, which is employed in the manufacture of lyddite. The creosote oil is used chiefly for boiling up with pitch for road paving and for pickling timber, particularly railway sleepers, &c. The naphthalene, or a portion of it, is sometimes sent out with the creosote oil. It is also rectified or sublimed and used for colour making and for disinfectants. It is at times used for fuel. The crude anthracene is filtered from the oil with which it distils over, and is subjected to hot pressing and steaming to remove some of the impurities. It is generally sold for colour-making purposes, containing 30 to 35 per cent. of pure anthracene. The anthracene oil, or heavy oil, as it is often called, is used in the manufacture of waggon grease and other lubricants, or is sent out with the creosote oil. The pitch is principally used for road paving, and also in the manufacture of patent fuel; being mixed with coal dust and moulded into briquettes. Of course, there are many more products obtained, there being scarcely any end to them; but these are a few of the principal ones.

The percentages of the different products vary considerably with different tars. The following, however, may be taken as about the average yield: Crude naphtha and light oil, 2 to 4; creosote and naphthalene, 5 to 10; 30 per cent. anthracene, 0·3 to 0·5; anthracene oil, 5 to 10; pitch, 60 to 65; and ammoniacal liquor and loss, 3 to 4.

[In the course of his paper, Mr. Smith incidentally mentioned that, during the recent South African War, the English Government prohibited the export of carbolic acid, one of the extracts from coal tar distillation, as it was largely used in the manufacture of picric acid, one of the ingredients in the manufacture of lyddite, which was being supplied to the Boers by Germany. The Germans had, however, with their usual inventiveness, discovered a substitute for carbolic acid; and the result was that we were now much worse off than before the war in finding a market for our production of carbolic acid.]

Discussion.

The PRESIDENT said he was sure the members would all admit that they had had a very instructive paper, especially from the point of view to which he had previously alluded—that many of them were not conversant with the distillation of tar, and perhaps on this account would scarcely be prepared to enter upon a discussion of the subject. He hoped, however, the matter would be gone into thoroughly; and he was quite sure Mr. Smith would be very willing to answer any questions, or supply any further information the members might require.

There being some reticence on the part of the members in offering remarks upon the paper,

The PRESIDENT said he might perhaps initiate discussion by asking Mr. Smith whether he had carried out many tests of tar made at different carbonizing heats.

Mr. SMITH replied that he had not had many opportunities of making tests of tar produced at various temperatures, as those they worked under had been pretty constant. He might say, however, that the difference of temperature affected the production of the light oils. When tar was being made at high temperatures, the light oils given off were very liable to become vaporized and carried away. The temperature had also an effect upon the heavy productions, which, under certain conditions, might become solidified and cause stoppage of the condenser tubes. The light productions were the most valuable; and, of course, the distillation of the tar would be carried out with the view to their production.

Mr. HILL (Stalybridge) asked what Mr. Smith thought about managers of gas-works going in for working up their own tar. He had known times when it would have been worth while, and also times when it would have been the reverse. To him, it seemed just now a question well worth considering, whether or not it would pay the owners of gas-works to distil their tar.

Mr. SMITH said a great deal depended upon the size of the works as to whether it was worth while going to the expense of putting down the requisite plant for the distillation of the tar. The prices of the different products, as they knew, ebbed and flowed considerably. One year they might have a good return from these products, and the next only a very poor one. But, taking one year with another, he thought it would pay a works making from 200 to 300 million cubic feet of gas. There was, however, not so much to be got out of it as there used to be. Anthracene, formerly considered to be the best-paying product, was now a drug, and was frequently left in the pitch, as, with the development of electric tramways and the price which could now be obtained for pitch, it paid better to do this. The question of carriage was another important item in considering the profitableness or otherwise of managers of gas-works distilling their own tars. In some instances the carriage to the distillery was a very serious item.

Mr. J. ALSOP (Stockport) wished to know whether at Mr. Smith's works they used dry or superheated steam, and what effect one or the other had upon the distillation of the tar.

Mr. SMITH replied that many people held that the steam must be superheated before it was used in the still; but he had never done this. The only superheat it got was from the heat of the still itself. They passed the steam direct from the boilers at about 40 lbs. pressure. As to the effect the steam had upon the distillation, it simply passed through, and was condensed into, water. As to keeping up the temperature, the best plan, as he had mentioned in his paper, was to use steam.

Mr. E. J. WELLENS asked the average life of a still.

Mr. SMITH said they had had two 8-ton stills which had been in use for eight years. These were replaced three years ago by a 15-ton still, and it looked almost as good as when put in. He should say that ten or a dozen years, with careful working, would be the life of a properly constructed still.

Mr. HILL said he had often thought that, by distilling the tar, they could work up profitably what they produced. They made about 850 tons a year, and the Corporation used about as much pitch as their tar would yield. It was his impression that if they distilled their own tar it might be made to pay.

The PRESIDENT asked what was the quantity of ammoniacal liquor held in suspense in the tar.

Mr. SMITH said this greatly depended upon the season. In cold weather it would be much more than in the summer months. In the former there might be as much as from 20 to 30 per cent.; and if it got into the still it caused violent bumping, and there was the risk of the tar overflowing into the condensers.

The PRESIDENT said he was sure the members would all wish to express their appreciation of Mr. Smith's paper.

Mr. HILL said he had great pleasure in moving a vote of thanks to Mr. Smith.

Mr. THORPE, in seconding the proposal, said he thought Mr. Smith had done extremely well to condense so much valuable information into the short compass of his paper, and put it in a useful and handy form for reference by members in future.

The PRESIDENT, in putting the vote of thanks, which was most heartily accorded, remarked that Mr. Smith was one of their members, and he hoped the paper he had read would be a stimulus to others to make similar valuable contributions during the sessions.

Mr. SMITH, in briefly acknowledging the vote, said he would be very glad if Mr. Stoddard, of Halifax (to whom reference had been made in the course of the discussion), could give them a paper on the subject, as he was in a position to supply very valuable information, and carry the question further than he (Mr. Smith) had been able to do. Mr. Stoddard could tell them something about the continuous process.

THE "GAS ENGINEERING" CLASS AT THE TECHNICAL SCHOOL.

In connection with the "Gas Engineering" class which has been arranged by the Association to be held in the Manchester Technical School, with Mr. F. Russell Hartley, Assistant-Engineer of the Salford Corporation Gas-Works, as the teacher, to which reference was made last week,

The SECRETARY (Mr. F. Oldfield) said there were already between twenty and thirty members who had given in their names to join the class.

Mr. TAYLOR (Oldham) asked whether the fact that members had gone through the course in this class would have any effect in connection with the City and Guilds Examinations.

The SECRETARY said there would be no examination in connection with the Technical School class. Thirty lectures were to be given; but these were simply as means of affording instruction to the members in constructional gas engineering work.

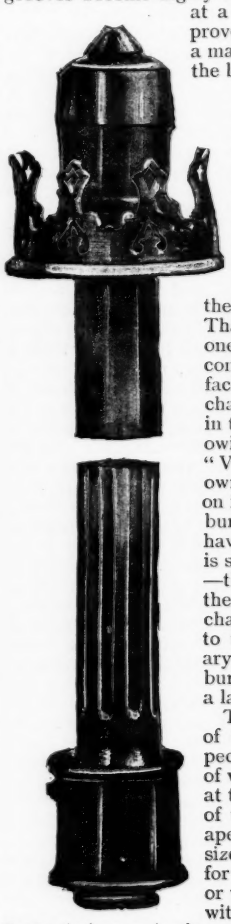
Mr. GARLICK remarked that the class had been inaugurated to provide theoretical and practical knowledge much wanted by many of their members, and it would be imparted by a man who had thoroughly practical experience.

The PRESIDENT said attendance at these lectures would greatly help any member who went in for examination in the gas engineering class.

The proceedings then closed.

THE "VIVID" INCANDESCENT BURNER.

Attention is called by the "Vivid" Incandescent Mantle Company, Limited, to a new burner which they have patented and are now introducing, and which possesses at least two features that are out of the common. The one to which most importance is attached is found in the stem of the burner. The stem is constructed of an outer and inner tube; and the latter is grooved all round. The object of this is not at first apparent; but a little consideration will show that the grooves serve for a secondary supply of air to the mixing-chamber in the head of the burner, and that the thin streams of air in their passage up the grooves become highly heated. That there is a passage of air at a considerable velocity through them is proved by the simple experiment of holding a match or lighted taper at their base when the burner is in use; and it is seen that the flame is immediately drawn up the air-passages. The effect of this supply of warm air (as described by the inventor) is this: "The air rushing up these passages cuts the mixture of gas and air ascending the interior of the inner tube before it reaches the point of combustion, amalgamates with it, and drives it with increased force through the gauze, with the result that the improved mixture and extra pressure enhance the brightness and steadiness of the light. That is the principal feature. The second one has reference, in the first place, to the complaint that burners of different manufacturers do not permit of that interchangeability of mantles which is desirable in these days of many makes of the latter, owing to their variation in diameter. The "Vivid" Company have a mantle of their own; but they are content to let it succeed on its merits without any reference to the burner. But to meet this complaint, they have made the head of the new burner, as is seen by the illustration, of barrel shape—the diameter gradually extending from the top to about half way down the mixing chamber. Therefore, with forks suitable to the length of mantle used, any ordinary type of mantle can be used on this burner. This form of burner head also gives a larger space in the mixing-chamber.



The foregoing are the distinctive features of the burner; but, in addition—more especially in view of the secondary supply of warm air—a movable collar is provided at the base of the burner for the regulation of the supply of air through the ordinary apertures. The burner is made in two sizes—one for street lighting and the other for interior use; and they are supplied with or without bye-passes as desired, but those without are most recommended. The domestic burner is also made of two qualities; but in the cheaper form the barrel-shaped head is absent.

There is only one other point, and that is as to the performance of the burners. They were submitted to inspection with gas at a pressure of 2 inches; and the results were excellent—there being an obvious improvement in the luminosity after a few minutes' use. Long mantles were used, but the incandescence was uniform throughout. This impression from a short trial is verified by the results of a test made by a prominent Gas Engineer. At 1½ inches pressure, he found the consumption of gas was 3·04 cubic feet per hour; and the total illuminating power 62·247 candles, which is equal to 20·474 candles per cubic foot. A No. 4 Welsbach mantle was used on the burner during the test. The burners are strongly constructed, and of irreproachable finish.

COAL-HANDLING PLANT AT THE TONBRIDGE GAS-WORKS.

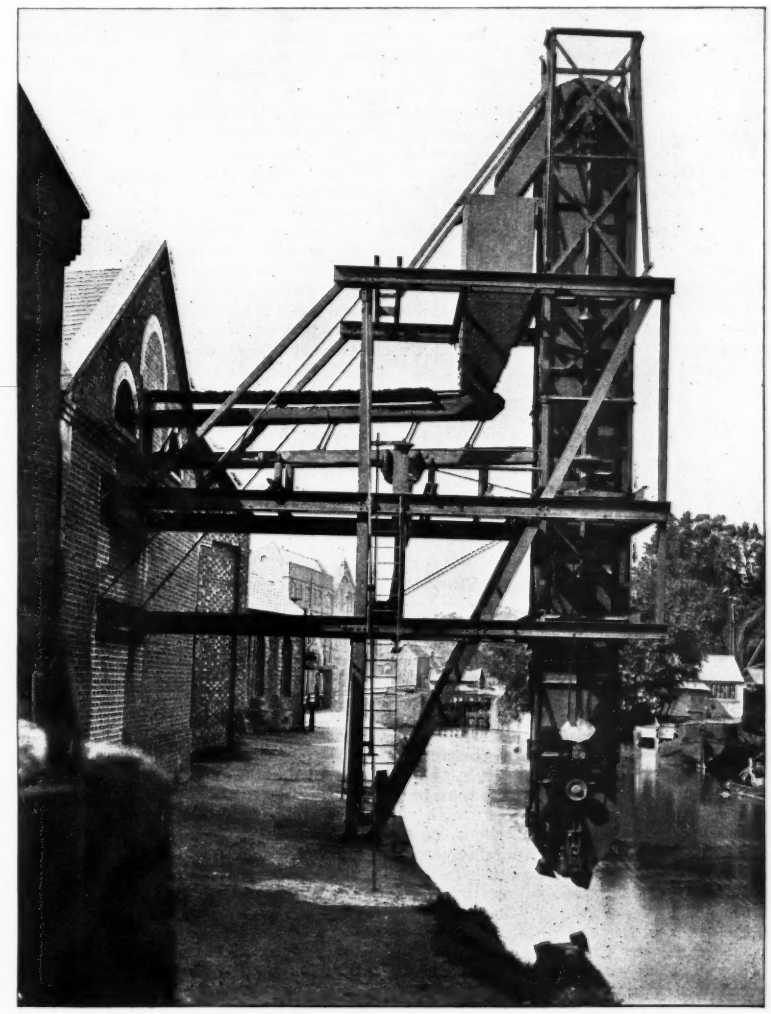
Readers of the notices of the working of Provincial Gas Companies in the "JOURNAL" for Sept. 15 (p. 687) may have remarked that, in the proceedings of the Tonbridge Company, reference was made to a very favourable report to the Directors by the Engineer and Manager (Mr. J. Donaldson) on a new coal-handling plant which has been installed at the works. For gas-works, as the accompanying illustration alone will show, the plant forms quite a new departure; and therefore a short description of it will be of interest.

The coal is conveyed to the works by means of barges or lighters; and it is in the unloading of these that the type of plant to be described has proved such a success. The coal-store is 120 feet long, 33 feet wide, and 20 feet high, and is situated about 14 feet from the water side; so the distance the coal has to be conveyed when once lifted, is not excessive.

The plant consists essentially of a vertical raising and lowering elevator, so arranged that it may be lifted and lowered into the barge at will; and, as the coal is delivered from the elevator, it is discharged on to a conveyor, which transmits the coal to, and distributes it in, the coal-store. The elevator is of the cased-in type, 36 feet centre to centre; the section of the elevator being arranged in a special manner for moving in the vertical latticed-braced guides which support it while it is being raised. On the sides of the elevator are arranged special cast-steel slippers for passing in the grooves of the upper latticed braced structure shown in the illustration. This casing and elevator are suspended by means of steel-wire ropes passing over jockey-pulleys on to the winding drum.

The raising and lowering mechanism consists of two drums, with a machine-cut worm wheel and phosphor bronze worm; the latter being driven by a vertical shaft from the main countershaft by friction clutch and bevel gear. As the elevator is raised or lowered by power, it is capable of being easily handled, and kept under full control. The working portions of the elevator simply comprise two endless strands of steel roller chain, stretched over the top and bottom sprocket wheels, with special buckets 18 inches pitch, specially adapted to take up the coal from the barge, and deliver it while in the vertical position. The structure for supporting the elevator consists of steel joists and channels, some idea of the stability of which may be ascertained on referring to the illustration. Owing to the height to which the elevator is raised when not in use, special wind ties were prepared for taking the strains; and the whole structure is specially adapted for the work required of it.

The conveyor over the coal-store is 109 feet long, and is so arranged that it receives the coal from the elevator in whatever position this may be when unloading. The coal is carried forward and distributed in the store; the discharge from the conveyor being arranged with outlets in the trough.



The power required for driving the plant is not excessive by any means; a 15 brake horse power steam-engine managing the work very easily. The power is transmitted from the pulley on the engine to the horizontal shaft (which can be seen along the side of the structure in the illustration); the gear being taken through special mitre and bevel wheels. The power for driving the elevator is taken off the engine-shaft by means of belting and countershaft gear on to the horizontal shaft running on the top of the structure. At the extreme end of the shaft next to the elevator is arranged a special pair of bevel-wheels, with supporting brackets; these being so adjusted that the two gear-wheels always remain properly in gear whatever may be the position of the elevator. The power required for hoisting or lowering the elevator is taken from the drums by means of vertical shafting, as previously explained.

The operation followed in unloading the coal is simplicity itself, and may be explained in a very few words. The barge, having arrived with its load of coal, is drawn under the elevator. The elevator is then lowered on to the coal, working at the same time. By this means, the elevator digs a hole for itself into the coal, and speedily empties the part of the barge into which it is lowered. All the bargeman has to do is to pull the boat in whichever direction he requires; while at the same time the elevator is constantly taking the coal out of the barge. One end of the barge having been unloaded in this way, the elevator is lifted, and then lowered into the coal the other end, and in this manner the barge is worked from end to end until emptied.

The rate at which the plant is capable of unloading a barge is about 25 tons per hour; but we understand that Messrs. Graham, Morton, and Co., Limited—the designers and contractors—have erected plants at several electricity works capable of handling a larger quantity of coal than this. The cost of the labour for unloading and conveying the coal into store is 1¼d. per ton. This is high for the class of machinery, but is due to the shallow barges used on the river at Tonbridge. With deep barges, the labour could be reduced to ¾d. per ton.

It may be said, in conclusion, that the manner in which the contract was carried out, and the simplicity of the whole arrangement, reflects great credit upon Mr. Donaldson, who is to be congratulated on being the first to adopt in a gas-works such a simple, yet effective, plant for reducing the manual labour in connection with the unloading of his coal supply.

The Glasgow Gas Engineership.—The Sub-Committee of the Glasgow Gas Committee have placed the following six names upon a short list of the applicants for the vacant post of Engineer and Manager of the Gas Department: J. H. Crowther, Wallasey; T. F. Ennis, London; W. Ewing, Greenock; S. Meunier, Stockport; Hubert Pooley, Stafford; and Alexander Wilson, Dawsholm, Glasgow.

Coal at Dover.—The first seam of coal at the Dover Colliery was entered on Friday by the new French method known as the "Kind-Chaudron" system. The seam was struck at a depth of 1190 ft. 7 in. Professor Etheridge, F.R.S., has examined the samples, and declares them to be good, bright, bituminous coal, such as is usually found at the top of a coalfield. It was in October, 1901, that the first block, proving the existence of coal at Dover, was brought to the surface.

INCLINED RETORTS FOR NEW YORK.

In the "JOURNAL" for June 9 last, there appeared a special article describing in outline the gigantic scheme of gas-works concentration which Mr. W. H. Bradley, the Chief Engineer of the Consolidated Gas Company of New York, has in hand for the supply of the city. The site of the new works, it may be remembered, is on Long Island, at what is known as Lawrence's Point—a little above Astoria. The project contemplates an ultimate daily output of 240 million cubic feet of gas; but the first section is to be a coal-gas plant of 20 million cubic feet capacity, and it is possible (from the information that Mr. Bradley gave when on his visit to this country last June) that two sections may be built right away. It will also be recollected that, according to present plans, the idea is to manufacture coal gas and carburetted water gas in equal proportions. The object of Mr. Bradley's visit to this country and to the Continent was to inspect and study the various systems of new retort-house plant; and therefore no information could then be given as to the character of the plant upon which his fancy would eventually rest. His inspection of works extended through England, France, Switzerland, Austria, and Germany; and we now learn that he has decided, by way of a start, upon an installation of inclined retort benches similar to those erected for the Imperial Continental Gas Association at the Mariendorf works at Berlin. The house for the accommodation of these will be built in the same style as the one at Mariendorf; and for the present the installation will comprise eight benches of eight beds of nine 20-feet retorts—in all 576 retorts. The benches will back—four in each line; and the chimneys will be erected in the middle of the house between the benches in the open space of the roof, also as at Mariendorf. The coal-hoppers and charging arrangements will be in accordance with the Drory patents. The contract for the entire construction has been placed in the hands of the well-known American firm of Bartlett, Hayward, and Co., in conjunction with the Stettiner Chamotte-Fabrik Actien-Gesellschaft (vormals Didier), Stettin.

NOTES ON GAS PURIFICATION.

By Dr. H. BUNTE.

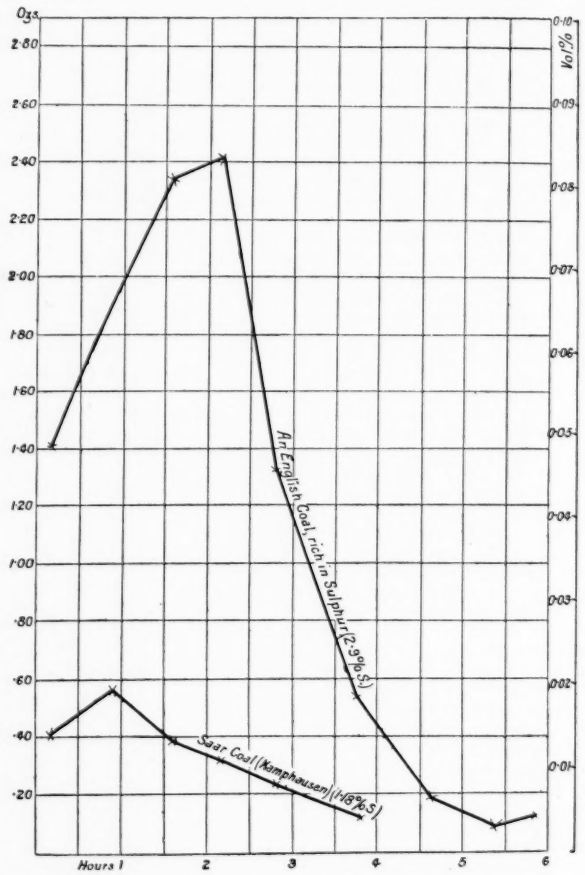
(*Continued from page* 750.)

In regard to carbonic acid, therefore, the question of gas purification has been totally changed, and much simplified, with the introduction of the incandescent burner. On the other hand, the increasing use of gas for heating and cooking has drawn attention to the remnant of sulphur compounds which formerly were scarcely considered. They occur in crude gas in addition to sulphuretted hydrogen, and cannot be removed by oxide purification. These compounds, consisting chiefly of carbon bisulphide, occur only in traces, and are of no importance hygienically, as numerous investigations and reports have demonstrated—for instance, a report by Pettenkofer in 1885. But when the products of combustion of the gas are partially condensed, as in gas-heating apparatus, acid condensation products are formed, which will attack metals. Since the use of gas for heating is continually spreading, and already accounts for a considerable portion of the output, it is interesting to study whether this remnant of sulphur compounds cannot be further diminished or altogether done away with. One of the author's pupils, Dr. Witzeck, has carried out researches on the origin of these compounds, and the different methods proposed—chiefly by English engineers—for removing them.

Odling's view—that these compounds are produced mainly in the latter stages of the carbonization of coal—has been hitherto generally accepted; and the larger proportion of carbon disulphide commonly present in gas made in England is attributed to the prevalence there of six-hour periods of carbonization, instead of the four hours usual in Germany. This view was supported by the fact that carbon disulphide, on contact with water vapour at high temperatures, decomposes and forms carbonic acid and sulphuretted hydrogen—thus: $CS_2 + 2H_2O = CO_2 + 2H_2S$. In the first stages of carbonization, water vapour is freely evolved, and the carbon disulphide produced at the same time may be decomposed thereby; but in the later stages, there is either no water vapour present or insufficient for accomplishing the conversion to sulphuretted hydrogen.

If this view were correct, the amount of sulphuretted hydrogen in the gas might be diminished by making up the deficiency of water vapour towards the close of the distillation by an artificial addition of it, or the distillation might be stopped at the stage at which the increase in the sulphuretted hydrogen was to be feared. Experiments carried out by Dr. Witzeck and Herr A. Schmidt, at the Carlsruhe Gas-Works, have, however, shown that the aforementioned view is incorrect, and that the course of formation of the sulphur compounds is different from that believed to occur. Two gas coals, differing very greatly in the amount of sulphur they contained, were used in these researches. One was the Saar coal, Kamphausen, containing 1·18 per cent. of total sulphur, and 0·65 per cent. of volatile sulphur, and the other was an English coal, of which the origin was not known more precisely, rich in sulphur, containing 2·90 per cent. of total and 2·65 per cent. of volatile sulphur. It is not implied that this was a typical English coal.

The curves in the annexed diagram show the results of the researches on the evolution of sulphur compounds—mainly carbon bisulphide—during the distillation of these two coals. It will be seen that with the coal which is rich in sulphur, the amount of carbon bisulphide in the crude gas rises rapidly for the first half of a four-hour period of working-off the charge, but then suddenly begins to diminish rapidly, and continues to diminish, even when the period is extended to six hours. Similar relations are observed with the coal which is poor in sulphur, though the changes are not so pronounced. In each case, however, the gas evolved towards the end of the distillation is not richer, but considerably poorer, in carbon bisulphide than that evolved in the first hours. A diminution in the amount of carbon bisulphide cannot therefore be expected to result from a shortening of the duration of the carbonizing time, nor can any appreciable effect be produced by passing in steam or moist gas towards the close of the distillation.



COURSE OF EVOLUTION OF CARBON BISULPHIDE IN THE DISTILLATION OF A SAAR COAL AND AN ENGLISH COAL—EXPRESSED IN OUNCES OF SULPHUR PER 1000 CUBIC FEET AND IN VOLUMES PER CENT.

Unfortunately, this disposes of the possibility of modifying the distillation process so as to diminish or avoid the formation of sulphur compounds which are not absorbed by oxide. Despite this negative result of the researches, they are valuable in other respects.

The experimental data indicate how important it is to use coal which contains but little sulphur, not merely for the sake of the purification from sulphuretted hydrogen, but also with a view to producing gas containing as little sulphur as possible in the form of other sulphur compounds. Taking the limit for the amount of sulphur in the gas at that which prevails in England—say, 22 grains per 100 cubic feet, or ½ oz. per 1000 cubic feet—the curve for the Saar coal shows that this limit is scarcely attained at all; whereas the coal which is rich in sulphur yields, at the outset, a gas containing 1·4 oz. of sulphur per 1000 cubic feet, rising in one test to 2·25 oz. and in another to 2·58 oz., and amounting, even towards the end of the fourth hour, to 0·85 oz. per 1000 feet.

Finally, in order to portray the manner in which the sulphur is disengaged when coal is distilled, either as sulphuretted hydrogen or as other sulphur compounds—chiefly carbon bisulphide—both sets of experimental results have been brought together in the diagram given on p. 750 of last week's "JOURNAL." Their juxtaposition brings out clearly the extraordinary increase, on the one hand, of the sulphuretted hydrogen, and the consequent overtaxing of the purification when coal rich in sulphur is used, and the

both relatively and absolutely small amount of the other sulphur compounds in crude coal gas.

This extreme dilution of the carbon bisulphide, which in most cases scarcely amounts to one hundredth part of one volume per cent., renders its removal or diminution by means of absorbents a matter of great difficulty, as to which London gas engineers, who have to keep the amount of sulphur below 20 grains per 100 cubic feet of gas, can tell a tale. Still, experiments at lowering the amount of sulphur by appropriate absorbents have some object; and the author would rather instigate trials than deter from them. Only a little while ago, a patent was taken out by Herren Pippig and Trachmann, for the employment of an alcoholic solution of aniline for abstracting the sulphur compounds; and it would be worth while ascertaining whether trials of it on a large scale have led to favourable results, as small scale trials hardly admit of a satisfactory conclusion being arrived at.

An extraordinarily long series of plans for removing sulphur compounds can be found in English patent specifications. A part of them may be dismissed without experimental investigation as clearly purposeless; but the others are well worth trial. It is quite possible that vigorous washing of the gas with tar-oils, as now practised in many places for the separation of naphthalene, would keep back a portion of the carbon bisulphide. The difficulty of finding appropriate apparatus and absorbents for effecting the separation of the vapours of carbon bisulphide, which occur in so highly diluted a state, must, however, be very great under all circumstances. Probably the object would most surely be attained by heating the whole of the gas and bringing about the reaction already referred to between the carbon bisulphide and the aqueous vapour of the moist gas, whereby carbonic acid and sulphuretted hydrogen would result. The expenditure of heat would not be considerable, as the reaction itself takes place without much absorption of heat, and an appropriate plant, accomplishing regeneration of heat between the incoming and outgoing gas, could be made. Trial of this method on a small scale has, however, shown that, in order to secure at all complete decomposition in the direction indicated, the temperature must be raised above 400° C. (750° Fahr.), even in the presence of iron or copper. So far, moreover, these trials at reducing the amount of carbon bisulphide in gas have had rather negative results. But much information has been gained by them; and the author would suggest that further trials and observations be made on a practical scale, as the question, while not one which can be easily solved, is evidently, from what has been done, not insoluble.

The foregoing might bring this paper to a conclusion so far as gas purification proper is concerned; but there is one other constituent which could very well be dispensed with—carbonic oxide to wit—as coal gas owes its poisonous qualities mainly to it. Means of removing it, or diminishing its amount, have repeatedly been discussed; but so far no practicable ones have been forthcoming. According as the coal used for gas making is of recent or old formation, and therefore richer or poorer in oxygen, the proportion of carbonic oxide in the gas fluctuates between 10 and 6 per cent. by volume. The mean proportion may be taken as 8 per cent. Yet, notwithstanding this poisonous constituent, coal gas has made its way throughout the civilized world, and for many years has been regarded as indispensable in every large community. Like all technical appliances and conveniences, gas supply is attended by a certain risk, which, however, can be reduced to the smallest dimensions. But it is necessary to combat utterances to the effect that gas taints our towns, and that gas-works should, on hygienic grounds, be relegated to the buried past.

Such statements in many cases might be passed unnoticed; but an expression of opinion of this nature has been made before the German Association for Public Hygiene—a body which purports to discuss questions of hygiene in a calm and rational manner. The matter therefore demands notice without reference to the personality of the speaker, Herr Oslender, of Düsseldorf. It was in the course of a communication on "Advances during the Last Decade in Central Heating and Ventilating Installations for Houses and Public Buildings" that he made the remarks to which exception must be taken. It might have been supposed that so decentralized a mode of heating as by gas-fires would not have fallen within the scope of his communication; but he found opportunity to refer to it. He first of all stated that the spread of heating by gas should be vigorously opposed on hygienic grounds, because many accidents and injuries were constantly being reported as caused thereby, and the unreported ones were not less numerous or harmful. The sense of smell, and the behaviour of plants in rooms, sufficed to indicate the objectionable character of heating by gas; and out of regard for the health of the community, gas-works should cease to exist.

To this expression of opinion, conveyed at much greater length and in stronger terms, several of his hearers took exception; and Herr Oslender, therefore, in replying to the discussion on his communication, attempted to vindicate his position. He admitted that it was a serious matter to propose the discarding of gas-works on which so many millions of money had been expended, and he would not advocate their being got rid of at one stroke; but he would oppose any further extensions. While every endeavour was being made to secure healthy towns, especially in the direction of providing good drainage systems, water supply, open spaces, and wide and clean streets, such endeavours were illusory so long as gas supply continued. The streets were coated with an 8 to a 12 inch layer of concrete, on top of which was asphalte paving. Beneath this impervious layer there were frequently large gas-mains, which were not sound, as the reports of gas undertakings showed that there was often a loss of 10 per cent. of the gas on its way from the works to the consumer. The gas so lost could not escape through the pavement of the streets to the open, and it therefore found its way into the basements of the houses. Mixing there with the air in the interiors of the dwellings, it vitiated it, and rendered all attempts to secure good hygienic conditions nugatory.

The frightening picture thus portrayed by Herr Oslender would be recognized by every gas engineer to be drawn from a quite erroneous view of the meaning of the so-called loss of gas between the works and the consumer. The term "loss" was used in Germany; but it would be better to adopt the English expression "unaccounted-for gas." The "lost" gas did not, in fact, signify gas which escaped into the air. The "unaccounted-for gas," or loss, is in reality the difference between the quantity of gas made and the consumption measured by hundreds and thousands of gas-meters or estimated for street-lamps. A great number of circumstances affect the extent of this "loss," quite apart from any gas which may in fact escape from the mains and services. For instance, a difference of temperature in the measurement of the gas made and of the gas-meters of 11° Fahr., will cause a variation of over 2 per cent. in the volumes read; and such a difference may well occur in winter time between the temperatures of the station meter and the consumers' meters. But putting aside all the conditions which affect the "loss"—such as condensation in the mains, errors in estimating the public lamp consumption, incorrect or non-registering gas-meters, the blowing-out of services, cracked mains, &c.—and assuming that, as Herr Oslender would have it, the whole loss of about 5 per cent. escapes through unsound pipes from the street distributing system, and is disseminated over the whole town, a short calculation would supply information as to the quantity of escaping carbonic oxide, and the attendant danger. On an annual make of 100 million cubic feet, the loss, at 5 per cent., would be 5 millions; and the carbonic oxide therein (at 8 per cent.) would amount to 400,000 cubic feet, which might escape in the course of the year from the services. This amounts to 1100 cubic feet per diem, or 46 cubic feet per hour for the whole distributing area, which, according to the local conditions, would have from 30 to 55 miles of mains. The calculation need not be carried farther, as it has been established that carbonic oxide completely loses its harmful character when it is diluted, so that it amounts to only 0·03 per cent. A moderately well ventilated room, in which the air was wholly changed once an hour, having a capacity of 200,000 cubic feet, would, if it received all the gas escaping over the whole distributing area, contain the poisonous carbonic oxide diluted to 0·023 per cent., or below the limit at which it could possibly do harm. Thus Herr Oslender has attributed to coal gas far greater capacity for harm than it can possibly possess. Apart from gas supply, there are many sources of carbonic oxide unfortunately existing in our towns, such as smoky and smelly chimneys, which far more deserve Herr Oslender's attention. Assuming that the chimney gases contain only an average of 0·2 volume per cent. of carbonic oxide, and that in a central heating station (as proposed by Herr Oslender) 1 ton of coal is burnt daily, with an air supply of 250 cubic feet per pound of coal, the carbonic oxide in the chimney gases would amount to 1120 cubic feet, or as much as that in the whole unaccounted-for gas of a gas-works with an output of 100 millions a year. This illustrates the misconceptions to which one-sided consideration of a matter may lead!

Disregarding Herr Oslender's statements as obviously misleading, it is, however, incumbent on gas engineers to do all in their power to avoid escapes of gas, and thus to minimize the dangers inseparable from the poisonousness of carbonic oxide and from other qualities of gas. By thus meeting, as far as may be, the requirements of public as well as private hygiene, it is the author's conviction that, instead of Herr Oslender's view that gas supply should cease prevailing, there will in the future be great scope for extension and improvement of it.

A FURTHER NOTE ON GAS-ENGINE EXPLOSIONS.

By H. E. Wimperis, B.A., Assoc. M.Inst.C.E.

[A Paper read before the British Association, Section G.]

In dealing with the proceedings at the annual meeting of the British Association in last week's "Journal," reference was made to the paper contributed by Mr. H. E. Wimperis; and in view of the interest attaching to his communication, we now give the paper *in extenso*.

The previous paper on this subject was contributed to the British Association in time for the meeting at Belfast last year. * The object of that paper was to show that the results of the experiments made by Mr. Dugald Clerk on explosive mixtures of coal gas and air contained in a closed pistonless cylinder can be reconciled with what may be expected to follow from calculations

* See "Journal," Vol. LXXX., p. 1335.

based upon the known properties of the substances employed. For many years it had been a mystery what became of the heat energy liberated on explosion; and many calculations were given showing that only about 50 per cent. of the total energy known to be liberated was accounted for in the pressure and temperature produced in the gas. Many suggestions were put forward to account for this; but for one reason or another, none were satisfactory.

Using the data employed by Professor Burstall in his remarkable investigations in connection with the Gas-Engine Research Committee of the Institution of Mechanical Engineers,* the writer assumed a variable specific heat for the gaseous mixtures used in Mr. Dugald Clerk's experiments, and was thereby able to show that the missing heat energy was reduced from about 50 per cent. to about 25 per cent. The rate of loss of heat energy to the walls of the vessel after explosion for any given temperature was next calculated; and then, making a simple assumption as to what occurred during the time of explosion (for the details of which reference may be made to the previous paper), it was shown that the heat loss so calculated was exactly sufficient to account for the 25 per cent. of heat energy which had yet to be traced. This agreement was welcome, as it removed the necessity to attribute the loss to a supposed after-burning of the gases.

Whenever this subject is under discussion, there are always two sets of experiments which are quoted—those of Mr. Dugald Clerk, and those of Mr. Grover. Those of Mr. Dugald Clerk have already been considered; and it remains now to see what can be made of Mr. Grover's. As will be observed from the curves in the diagram, the pressures recorded by these two experimenters are far from being in agreement.

It was Mr. Grover's idea not only to measure the pressures produced by various richnesses of mixture of coal gas and air, but to investigate whether the resultant pressure on explosion was affected by replacing the air in excess of that calculated as chemically necessary for complete combustion by a portion of the burnt products of the previous explosion. It appears from Mr. Grover's account of his experiments that he had an iron cylinder of 1 cubic foot capacity, and that in each series of experiments the volume of the coal gas admitted was kept constant, and the cylinder was then filled with a mixture of air and waste products in various proportions. This was done in each series by filling the cylinder with water, and allowing gas to enter while a known volume of water was run out. Thus, after an explosion, water was allowed to pass into the cylinder until all but the required volume of burnt products had been forced out; so that if it was desired that no burnt products should be left, the cylinder would be completely filled with water. But if (say) 50 per cent. of the volume of the cylinder was required to contain burnt products, the water would only be permitted to rise halfway up the cylinder.

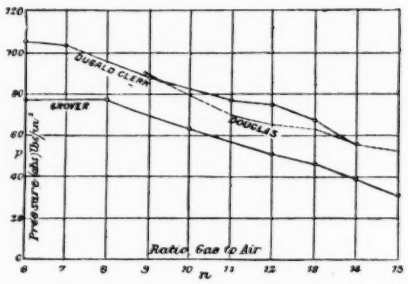
The pressure was recorded in the customary manner on a rotating drum; but very few of the curves are given in the published account of the experiments. It is therefore difficult to make a very exact comparison between the time-rate of the fall of pressure after explosion in Mr. Grover's experiments—using, of course, those experiments in which no burnt products were admitted—with those of Mr. Dugald Clerk. However, so far as the curves can be examined, they show for the same pressures almost exactly the same rate of fall—a result which is the less unexpected, as the diameters of the two cylinders appear to have been nearly equal. It is not difficult to calculate what the ideal maximum temperature and corresponding pressure of explosion would be were there a variable specific heat, but no cooling of the gas by the walls; and when this has been done, it may be compared with the pressure found experimentally. The following table shows the result of such a calculation :—

Ratio of Gas to Air.	Pressure Observed.	Pressure Calculated.	Difference in Energy. (Approx.)
	(absol.)	(absol.)	ft.-lb.
15	31	73	21,000
14	39	76	19,000
13	46	79	18,000
12	51	83	18,000
10	63	92	18,000
8	77	104	18,000
6	77	119	31,000

In this table, there is also given the difference in the heat energy between the gas at this temperature and at the actual temperature attained. These amounts were found in Mr. Dugald Clerk's experiments to be of almost exactly the calculated amount that would be expected to be lost to the walls and ends of the cylinder by cooling during the time of explosion. Such a hypothesis, however, is found not to fit Mr. Grover's results. Nor is it to be expected, having regard to the extreme divergence between their results, that both would be susceptible to like treatment.

The curves in the diagram show the actual pressures plotted with respect to richness of mixture for the experiments of both investigators. It is seen that Mr. Grover's curve lies far below that of Mr. Dugald Clerk. This cannot be due entirely to the different cylinder volumes used (317 and 1728 cubic inches), or to differences in the chemical constitution of the gases, because, as will be seen from the dotted curve, there is little disagreement between the results obtained by Mr. Dugald Clerk and by Mr. Douglas, although the results* obtained by the latter were for gases enclosed, not in iron cylinders, but in an eudiometer tube. If the use of an eudiometer does not produce results more different from Mr. Dugald Clerk's than this, the presumption certainly is that some factor must have entered into Mr. Grover's experiments which has entirely masked his results. A suggestion as to what this factor could be has been made by Mr. Grover himself; for in describing one experiment, he says: "The difference is no doubt due to the fact that water was present on the walls of the cylinder. But Mr. Grover apparently did not consider that this presence of water affected his conclusions on the subject generally—conclusions which are set forth on pages 231 and 232 of his "Modern Gas and Oil Engines." The writer has no hesitation in attributing not only the discrepancy in the heat balance-sheet of the experiments, but also the extraordinary results obtained in the allied series of experiments, in which burnt products were present, to the effect of a water film.

There is, of course, a limit to the quantity of water which could adhere to the walls of the cylinder; and it is necessary to see whether the required amount is what could reasonably be expected to exist. The average loss of energy given in the fourth column of the table is about 20,000 foot-pounds; and considering the average energy given to 1 lb. of water to raise it from atmospheric temperature to superheated steam at the average maximum temperature as about 750 C. heat units, it follows that the weight of water required equals 0·0191 lb. This would occupy a space of about 0·53 cubic inch; and in a cylinder of the dimensions used, a film of water $\frac{1}{2000}$ inch thick would be sufficient to account for this. Evidently, therefore, there is no difficulty in accounting for the presence of a sufficient quantity of water. It is interesting to assume the presence of a small quantity of water, and to trace its effects throughout the whole explosion. As it happens, the actual calculations involved are a little tedious. As the temperature rises, the vapour tension of the water increases until a time comes when steam is given off. This, of course, does not occur at the ordinary boiling point, as by this time the gases in the cylinder will be at a pressure in excess of the atmospheric pressure. The



temperature still rises; but so long as there is any water left, the steam is saturated, and the temperature of the gases must therefore keep step with the pressure—that is, if the contents of the cylinder are assumed to be all at the same temperature at the same time, and without such an assumption calculation is out of the question. Next, a point is reached at which the steam begins to be superheated. Further, the formation of a volume of steam has meant the compression of the gases in the cylinder, so altering the relation between the pressure and the temperature, and bringing a further complication into the matter. It therefore becomes a matter for careful treatment to draw out a temperature entrophy curve for the whole. (Perhaps the simplest way is to think of the gas and the water stuff being kept separate by a thin diaphragm, but maintained at the same temperature at the same time.)

To show the result of the steam compressing the gas, a simple example may be taken, in which the weight of the film of water is $\frac{3}{8}$ of the weight of the gaseous mixture, and in which both start at atmospheric temperature and pressure. When the pressure (absolute) amounted to 33 lbs. per square inch, a calculation made in the absence of the knowledge of the presence of a water film would give a temperature of 254° C.; whereas the real temperature would be 124° C.—a very different result. A further calculation with the same amount of water present shows that a pressure of 60 lbs. per square inch would be attained on explosion; whereas, under the same circumstances, but in the absence of the water film, a pressure of 100 lbs. per square inch would have been attained.

The curves and table given above are for the experiments made by Mr. Grover with mixtures of coal gas and air only. No burnt products were present. When burnt products were admitted, very remarkable results were observed. Taking the first series† of experiments (in which the volume of coal gas was $\frac{1}{16}$ of the total of the cylinder), when there were no burnt products present, the pressure recorded was 16 lbs. per square inch above the atmosphere. When burnt products were present to

* See "The Engineer," April 22, 1887, and Nov. 7, 1902.

† Grover's "Modern Gas and Oil Engines," 1902 edition, p. 233.

"JOURNAL," Vol. LXXI., pp. 399, 1008; Vol. LXXVIII., pp. 1030, 1167.

the extent of 1/3·3 of the volume of the cylinder, the pressure rose to 35 lbs. per square inch above atmosphere.

Now it will be observed that in the experiments in which burnt products were absent, the whole of the interior of the cylinder must have been wetted by the water used in the measurement of the volumes; and, on the other hand, when burnt products were present, the water only rose up to two-thirds of the height of the cylinder. Hence, in the second experiment, one-third of the exposed surface was dry, and would therefore cool the gases in the manner already observed in Mr. Dugald Clerk's experiments; while the remaining two-thirds of the surface was covered by a water film, which would, as explained above, absorb much of the heat energy of the gas before it was evaporated. When the whole surface was wet, only 16 lbs. per square inch was registered; and when one-third was dry and two-thirds wet, the pressure rose to 35 lbs. per square inch.

The writer holds the presence of a water film of varying extent to be a sufficient explanation of the very curious results obtained by Mr. Grover. The hypothesis upon which this explanation is made leads, however, to a further deduction, the truth of which it remains to investigate. Mr. Dugald Clerk's curves showed that the rate of loss of heat energy to the walls increased much more rapidly than the temperature of the gas—in fact, the rate of loss was about proportional to the third power of the absolute temperature. It follows, therefore, that in the richer mixtures, in which higher temperatures would be attained, the increase in the loss owing to the increased cooling effect of the fraction of dry wall exposed would be much greater than the saving due to the water film only covering two-thirds instead of all the surface, and that in consequence, for the richer mixtures, the apparent effect of burnt products in increasing the resultant pressure would be much diminished, if not extinguished altogether.

Now this is precisely what was found by Mr. Grover to be the case. When the ratio of the volume of gas to the volume of cylinder was 1 to 13, the effect of burnt products was to increase the pressure from 36 lbs. to 43 lbs. per square inch—a far smaller increase than before; and when the ratio was increased to 1 to 9, the effect was quite wiped out, and the pressure fell almost immediately the burnt products were admitted. After all, it is not wonderful that the extraordinary results found by Mr. Grover should be capable of being accounted for without assuming that the burnt products really would increase the pressure under such conditions as usually hold in a gas-engine cylinder. The only reason why burnt products might exercise any such tendency would lie in their having a much smaller specific heat than air; and this is not so. In practice it has, of course, been found that the presence of burnt products in the explosive mixture has a by no means good influence on the economy of gas-engines.

The writer considers that the time has certainly come for variable specific heats to be employed; and it may be greatly doubted whether any calculations or curves put before the world at the present time can be regarded as of value, unless there is at least given an alternative calculation founded on the basis of a variable specific heat. A linear equation connecting specific heat with temperature was used by Professor Burstall in his calculations for the Institution of Mechanical Engineers; and it was not found to give inconsistent results. Professor Burstall appears to have made his calculations thus: The exact amount of energy liberated on explosion was known. The variable specific heat allowed of three-fourths of the energy being accounted for. It was then assumed that the remainder was lost to the water-jacket during explosion; the amount so lost during expansion being taken as the difference between the work done and the change in the internal energy of the gas. The same process being carried out during the compression, the net loss to the jacket per cycle could be calculated. This should agree with the observed loss owing to the heating of the water-jacket; and in practice a very satisfactory approximation was observed.

In this paper, and in the previous one, the writer has attempted to bring into line with our modern knowledge the previously inconsistent results obtained by Mr. Dugald Clerk and Mr. Grover; and he trusts that the analysis will be held to have met with some degree of success.

The Surcharged Shoreditch Councillors.—We learn from the "Municipal Journal" that it has been decided to test the legality of the surcharge of fourteen members of the Shoreditch Borough Council, to make up the deficiency of £6198 on the rate collection, to which reference was made in our columns last week (p. 727). This step is being taken as a protest against the action of the Auditor, which is considered arbitrary. Only one of the members will, it seems, go into Court; and he will be guaranteed against loss should he fail in his application. It is thought the surcharge may be withdrawn.

Incandescent Gas Lighting at Scarborough.—About 150 incandescent gas-lamps have been installed in Scarborough during the last six months; and the experiment is stated to have been an unqualified success. The cost of the lanterns and of fitting the incandescent burners has been defrayed by the Gas Company; but the Corporation will bear the expense of maintaining the mantles, which will, however, be covered by the economy in the consumption of gas. Practically, therefore, the town is getting a vastly improved light without any increase in cost. The Gas Company are to be congratulated on the success which is attending their demonstration of the superiority of incandescent gas over electric lighting. Electricity is dear in Scarborough; and already there are rumours that several tradesmen who are using this illuminant will return to gas during next winter.

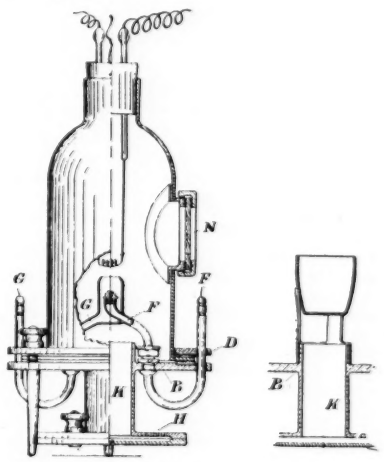
REGISTER OF PATENTS.

Chains for Conveyors and Elevators.—Little, A., of the New Conveyor Company, Limited, Smethwick. No. 21,443; Oct. 2, 1902.

The kind of conveyor and elevator chains to which this invention relates are formed of alternate pairs of inside and outside links jointed together by pins. The two inside links are connected together at each end by a metal (preferably steel) bush or distance-piece located between the links and made of the proper diameter inside to receive the joint-pin. It is shouldered down at the ends to fit in the eyes of the links, where the bush is secured, by pins or other means, so as not to turn in the eyes. The two inside links with the two bushes thus practically form one piece. The joint-pin, which passes through the two outside links and through the bush, is compelled to turn with the outside links by the joint-pin having a feather or projection which takes into a recess in the eye of the link, or the parts are otherwise formed so that the joint-pin must turn with the two outside links. Thus, says the patentee, when the chain is in use, "there will be no wear on the eyes of the links, as all the wear will be taken on the bushes and on the joint-pins, which can readily be renewed; and as the bushes have long wearing surfaces, the wear is reduced to a minimum."

Calorimeters.—Darling, C. R., of Plumstead, S.E. No. 21,484; Oct. 3, 1902.

The object aimed at in this patent is to permit of the adapting of a calorimeter for the testing of either solid fuel or gases. As shown, the calorimeter—made of copper or other suitable material—is mounted on a plate B supported by legs. A flange on the cover passes between the plate and a ring D; rubber packing-rings being inserted between the flange and the plate and ring. Screwed extensions of the legs pass through the plate B and the ring, and, by screwing down the nuts engaging these extensions, a gas-tight joint is made. N is a window, of glass or other suitable material, which is fastened in



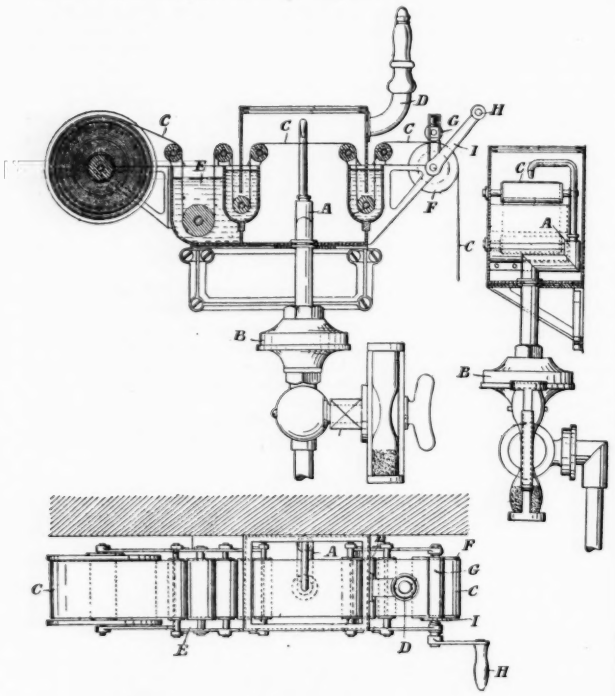
position by a hollow nut and packing material, so as to make a gas-tight joint. The window is placed at such a height as to enable the combustion taking place in the interior to be visible from outside. The products of combustion pass down the pipe K and through the small holes H in the flange of K, which, together with the base-plate, is hollowed out to furnish a means of exit into the water surrounding the apparatus when in use.

The invention further consists of an arrangement of tubes passing into the interior of the bell-jar or cover, so that combustible gases may be burnt in the calorimeter. To this end the springs S, which hold the crucible (when the calorimeter is employed for solid and liquid fuels), are made detachable. After the springs are removed, the tube F is connected to the supply of gas, and is continued through the plate B by means of a gas-tight union, terminating in the nozzle E, at which the gas is burnt. A supply of oxygen for the combustion is furnished by means of the tube G, which passes into the interior of the bell-jar or cover in the same manner as the tube F, and terminates in a wide tube surrounding the nozzle E. The gas is ignited by electricity. The products of combustion escape through the holes H. The tubes F and G may be detached when desired, and the holes in the plate B closed by studs or plugs, so that the calorimeter may then be used for solid or liquid fuels.

Testing Illuminating Gas.—Lake, H. H.; a communication from the Gasmesserfabrik Mainz Elster and Co., of Mainz, Germany. No. 25,958; Nov. 25; 1902.

The testing of illuminating gas in order to ascertain the percentage of sulphuretted hydrogen which it contains has hitherto mostly been effected (the patentees point out) by holding strips of paper saturated with sugar-of-lead solution in front of a test-cock and observing whether the issuing gas blackens the paper. What are called sulphur testers have also been employed, in which a strip of paper saturated with sugar-of-lead solution is suspended in a glass cylinder and submitted to the action of the gas. These appliances are not, however, very practical, as it is troublesome and occupies too much time to saturate the sheet of paper upon each separate occasion and insert it in, and remove it from, the test cylinder. Finally, sulphur testers have been constructed in combination with a gas-meter, in which a dry strip of

paper (which has been treated with a suitable solution) is submitted to the action of the gas passing through the meter. Appliances of this type are, they remark, in the first place somewhat unreliable, as the reaction of the gas on a dry strip of paper is far from being as intense as its action on a saturated strip; while, on the other hand, the gas-meter connected with the apparatus soon becomes useless, owing to the passage through it of impure gas. The present invention therefore refers to the testing of illuminating gas for its percentage of sulphuretted hydrogen, by apparatus which, while obviating the defects enumerated above, permits of the testing of the gas in such a manner that the action of the gas on the test-sheet may be observed either for a predetermined period or uninterruptedly.



A side elevation of the apparatus, partly in section, a plan view, and an end elevation of the appliance, partly in section, are shown.

The apparatus consists of a box provided at each end with a mercury seal rendering it gas-tight. At the upper portion of the box is an inspection aperture, glazed or covered with transparent material. Through the bottom of the box passes a gas supply-pipe A terminating in a glass tube above, while its lower extremity is provided with a volume regulator B and gas-cock. The handle of the gas-cock is (in the example illustrated) connected with a sand-glass in such a manner that, on rotating the cock from the open to the closed position and at the same time observing the hour-glass, a definite period of gas-admission may be readily determined during which the gas entering the box is acting upon the test strip C.

The gas is conducted from the box through a tube D, which opens outside. This tube may be provided with a burner.

The test strip is unwound from a roller, and passes over rollers through a vessel E containing sugar of lead or some equivalent solution. The strip then passes through the mercury seal into the box, then over other rollers, and finally it passes between two pressure rollers F, G, of which the latter is pressed against the strip in such a manner that, on rotating the former by means of the handle H, a certain length of the strip is drawn out of the apparatus.

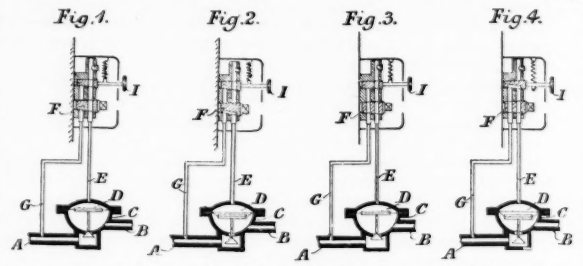
Illuminating gas may be tested for the percentage of sulphuretted hydrogen by means of this apparatus in the following manner: By turning the handle, a length of test paper, freshly saturated with sugar-of-lead solution, is brought under the glass inspection plate in the box, whereupon the cock is opened, and gas flows through the glass tube and acts upon the test strip C. When the sand-glass has run down, the cock is closed, and the paper is inspected to ascertain whether it has been blackened. By merely turning the handle to bring a fresh length of the strip into position, a fresh examination may be made, as before. In each case the volume of gas entering the box during a definite period is automatically regulated by means of the governor B. The strip of test paper leaving the apparatus between the rollers F, G, may be cut into separate pieces, provided with notes as to time, and kept as a record.

In order to adapt the apparatus for continuously testing the percentage of impurity contained in gas, the handle shown may be replaced by a gear-wheel connected with the mechanism of a clock, which produces a constant but slow advance of the test strip. If the strip of paper is provided with an impression corresponding to time divisions of the clock work, it will be possible to ascertain, from the darkened places on the strip, at what time, and for how long, impure gas passed through the apparatus or the purifier connected with it.

Devices for Temporary or Continuous Lighting by Gas.—Meier, G., of Berlin. No. 14,267; June 27, 1903.

This invention relates to an appliance for the temporary or continuous lighting by gas (such as is, for instance, employed on staircases, chandeliers, and the like) arranged in connection with any self-acting or other igniting devices in the floor; while a valve connected to the switch case is inserted in the gas service-pipe. Fig. 1 shows the relative position of the cock in the day time, and fig. 2 the position for continuous lighting until about ten o'clock. Figs. 3 and 4 illustrate the position of the switch for temporary lighting during the night.

A pressure-reducing valve C is included in the main conduit A, B; that face D of the valve which is connected to the atmosphere—instead of leading directly to the outside—being connected by thin tubing E with a cock F. The valve body F is also connected, on the other hand,



to the gas-conduit by another thin tubing G. The cock body is furnished with three holes, arranged at a distance of 120° from each other, and is also provided with an exterior longitudinal slot. From the cock two conduits lead off to another smaller cock M, the body of which is provided with a transverse bore connected to the atmosphere and with a longitudinal slot adapted to temporarily connect the two passages G and E. The cock body may be easily turned at any time through 90° by operating the button I by hand. When the knob is released, the cock body is immediately forced back into its initial position by a spring.

In the day time (fig. 1), the face side D of the valve is connected to the atmosphere. This results in the membrane of the valve being bent upwards by the pressure existing below it; so that, where a constantly burning igniting flame is used, the average sectional area of the gas-passage to the burner is reduced, and, in the case of automatic ignition, the admission of gas is completely cut off. In the position for evening time (fig. 2), the cock body F effects the connection of the gas-admission conduit A with the atmospheric side of the valve. By this means, the valve is also exposed on this side to the pressure of the gas (the membrane being bent through downwards), and the admission opening for the gas is opened to the burners. In the position shown in figs. 3 and 4, the cock body F is adjusted for night time; and it thereby opens its two passages so as to establish communication with the upper cock body, which is retained in the position shown in fig. 3 by the spring if the admission of gas to the burner is cut off. Fig. 4 shows the position of the cock body at the moment of ignition. The gas passes from the branch conduit G into one hole of the cock F, and then to the upper cock; then through the connecting slot of the cock body, and through the other hole of the cock F above the membrane; and, by pressing upon the membrane, it causes the depression of the valve cone. Upon releasing the knob I, the upper cock is forced back into the initial position shown in fig. 3; the gas which has passed in the direction towards D slowly escaping into the atmosphere. By this slow and narrow escape opening, the throttling action of the valve C is retarded and the gas-flames extinguished after some time only.

Gas-Burners.—Kramer, W., of Brooklyn, U.S.A. No. 15,551; July 14, 1903.

This is an improvement upon the type of gas-tip having two opposed gas-openings, forming a continuation of an intermediate narrow slot, and communicating with an inner chamber in the body of the burner with two channels connected with the openings. The channels are formed by indenting the sides of the burner (as shown); and the gas opening is formed between the indentures. The indentures are brought quite close together so as to form a narrow passage between them, which communicates with the channels.

The object aimed at is to produce a tip which will prevent "blowing" of the flame, so that when used with high-pressure gas the flame gives a steady light. The patentee says he has found that, by providing an intermediate chamber or reservoir directly beneath the gas-opening in the side channeled tip (which intermediate chamber communicates throughout with the side channels), "blowing" is almost entirely prevented. The chamber referred to is readily formed by a different manner of pinching the sides of the tip; so that, instead of bringing the indentured sides of the tip close together, outwardly convex portions are made in the sides of the tip—the convex portions forming the intermediate chamber referred to.

Without attempting to formulate any exact theory to account for the "unquestionable advantages" of this improved gas-tip, the inventor says it would seem that the intermediate chamber formed just beneath the gas outlet acts as an expansion chamber or reservoir to check the flow of gas, and thus operates as a pressure regulator.

Gas-Producers.—Duff, A. B., of Pittsburg, U.S.A. No. 16,164; July 22, 1903.

In gas-producers hitherto constructed, the air (or air and steam) has, says the patentee, either been distributed by means of gratings placed

more or less vertically in a bottom casing, or by a louvred cone or hood delivering the air either downwardly or more or less horizontally. His proposal is to improve the construction of producers, and increase their efficiency by providing for the more regular and efficient distribution of air, or of air and steam, to the fuel being gasified, by combining the two methods of introducing the air, or air and steam, to the producer—superimposing the louvred cone on a casing having more or less vertical gratings. With this combined construction, greater rapidity of action is said to be secured, and the fuel is more perfectly reduced to ashes, as while the combined blowers work simultaneously, the streams of air, or air and steam, act consecutively upon the fuel as the latter moves downwards—the upper conical blower delivering air to light up the fuel to incandescence, while the lower grating causes the air to act upon the fuel with a finer distribution, and completely reducing the remaining partly gasified fuel to ashes.

APPLICATIONS FOR LETTERS PATENT.

19,220.—Wesselsky, L., "Generating exhaust (hydrogen) gas and other gases from small and dust coal." Sept. 7.
19,239.—Cox, J., "Incandescent gas lighting." Sept. 7.
19,264.—Sugg, W. T., "Suspension lamps." Sept. 7.
19,318.—Alexandra, C. J., "Forks for incandescent mantles." Sept. 8.
19,341.—Hayes, R. T., "Laying pipes for gas or water." Sept. 8.
19,360.—Thompson, W. P., "Burners." A communication from the Rath Light Company. Sept. 8.
19,428.—Curth, A., "Utilization of the exhaust gases of explosion motors." Sept. 9.
19,442.—Kunwald, M. de, "Manufacturing acetylene." Sept. 9.
19,519.—Gross, F., "Atmospheric gas-burners." Sept. 10.
19,523.—Wilson, J., "Gas-producing furnaces." Sept. 10.
19,555.—Lister, J. T., and Redington, J. C. O., "Incandescent mantle supports." Sept. 10.
19,589-90.—Snell, C. S., "Incandescent gas-burners." Sept. 11.
19,598.—Sheppard, W. D., "Gas cooking-stoves." Sept. 11.
19,706.—Helps, G., "Hydraulic mains." Sept. 14.
19,803.—Nyren, T. B., "Washing and scrubbing gas." Sept. 15.
19,804.—Underwood, G. F., "Controlling gas lights and supplies." Sept. 15.
19,910.—Harkins, J. E., and Willis, J. B., "Toasting apparatus for gas-stoves." Sept. 16.
19,929.—Catier, E., "Generators for power gases." Sept. 16.
19,955.—Cooper, G. W., "Generating acetylene gas." Sept. 16.
20,003.—Smith, B. W., "Cluster light for gas-burners." Sept. 17.
20,022.—Burley, J. D. C., and Gilmore, A. E., "Coin-counting and registering attachments for gas-meters." Sept. 17.
20,072.—Du Bois, E., "Coin mechanism for meters." Sept. 17.
20,087.—Fletcher, Russell, and Co., Ltd., and Neil, A. & W. R., "Condensing gas-stoves." Sept. 18.
20,093 —Southall, J., "Internal combustion engines." Sept. 18.
20,099.—Ryan, C., "Incandescent gas-burners." Sept. 18.
20,164.—Reuter, T., "Gas-turbine." Sept. 18.
20,179.—Arthur, T., "Lock and key for slot meters." Sept. 19.
20,211-2.—Moeller, J., "Burners for incandescent lighting and heating." Sept. 19.
20,226.—Bleriot, L., "Acetylene gas-generators." Sept. 19.

Re-Lighting of Yatton by Gas.—Owing to a dispute between the ratepayers of the village of Yatton, in Somersetshire, and the Directors of the Gas Company, the public lighting was discontinued last winter. The inconvenience was so great that it was determined not to have a repetition of it this year; and the re-lighting of the streets by gas took place a few evenings since, to general satisfaction.

The Case of Suffocation by Gas at Bristol.—An inquiry was held on Monday last week into the circumstances attending the death of Benjamin Evans, which took place in the Bristol Infirmary on the 17th inst., as the result of gas poisoning (*ante*, p. 767). One of the witnesses called was a collector in the service of the Bristol Gas Company, who saw the unfortunate man being removed. On learning the cause of the accident, he examined the bedroom in which Evans was found, and discovered that a piece of the flooring under a chest of drawers had been taken up, and a gas-pipe beneath twisted off—one end being curled up in corkscrew fashion. The pipe originally supplied a chandelier in the room below. He did not think an instrument had been used to sever the pipe, which did not belong to the Company. The Coroner (Mr. A. E. Barker) said the appearance of the pipe did not suggest that the severance had been made with the idea of permitting the escape of gas. The Jury returned a verdict to the effect that the deceased had committed suicide, but that there was no evidence to show the state of his mind.

The Price of Gas at Bingley.—The principal subject of discussion at the meeting of the Bingley District Council on Monday last week was a proposal by Mr. A. Hartley that the price of gas should be reduced from 2s. 9d. to 2s. 6d. per 1000 cubic feet as from the 1st of July last. He pointed out that the past year's working of the gas undertaking had produced a profit; that the profit would have been larger had not the Committee utilized some of the surplus in paying for extension works; that the coal contracts had been let at a lower figure than in any year since the prices went up; and that therefore the Committee ought to be in a position to put the consumers and the ratepayers on the footing in regard to price which they occupied before the year of inflated coal prices came, when the charge for gas was increased 3d. per 1000 cubic feet. Mr. Wildon, the Chairman of the Committee, and other members, opposed a reduction on the ground mainly that it was desirable that a reserve fund should be built up in connection with the Gas Department; but they also argued that experience had not shown that it was possible to sell gas at 2s. 6d. per 1000 cubic feet and make an adequate profit. Eventually the proposal was defeated by a large majority; only the mover and seconder voting in its favour.

MISCELLANEOUS NEWS.

PARLIAMENTARY COMMITTEE ON MUNICIPAL TRADING.

Portions of the Evidence Abstracted.

Third Day—June 29.

Mr. Charles H. Wilson.

Further evidence on the subject of the auditing of municipal accounts was tendered by Mr. Charles H. Wilson, an incorporated accountant, President of the Society of Accountants and Auditors, and Lord Mayor's Auditor and Chairman of the Parliamentary Committee of the City of Leeds. He said that in his opinion the system of elective auditors was absolutely discredited. Very few voters could be induced to take part in their election; and in addition to this, there was no guarantee that they should be men who were trained as accountants. Though his Society had endeavoured to induce members to stand for the office, many of them were so interfered with as to their views upon questions of politics or Socialism, or other things, that they had retired from the contest in disgust. Many corporations had supplemented the system by themselves electing chartered or incorporated accountants, though if it were closely looked into, it might be found that they were exceeding their powers under the general law in so doing. There was an obscure clause in the Municipal Corporations Act, 1882, which gave corporations power to appoint their officers; but he was in doubt as to whether this clause could be applied to the audit. He was not in favour of any extension of the audit system of the Local Government Board. The auditors should be appointed by the corporations themselves, subject if necessary to the approval of the Board.

Turning to the question of accounts, witness said there would be no difficulty whatever in prescribing a standard form (subject to certain variations) for trading concerns. Separate accounts should be kept for each undertaking, so that anyone acquainted in the slightest degree with accounts would be able to see for himself what had been done, and would be able to follow clearly any transfer of profits to the municipal or borough funds. The profit and loss on each undertaking should be clearly shown for the information of the ratepayers. The proper way to deal with the balance of profit made in one department, or loss in another, was to transfer it to the general fund, and not to another department. Instead of taking the profit from gas-works and putting it to a loss on water-works, it would be better to put everything to the borough fund. It was, of course, possible to have a form of accounts showing the profit on the gas works, and the same form as near as might be showing the loss on the water-works; and then, by resolution of the Council (assuming that their Acts allowed it), a sum might be transferred from the gas-works to the water-works. He, however, preferred that all these profits and losses should be dealt with, as most of the Acts required, through the borough fund.

In reply to a query as to whether the profit or loss should be shown after making all allowances for depreciation, witness said he was aware that this was a vexed question. It ought to be borne in mind that the sinking fund, put upon all municipalities by Parliament, operated sufficiently well to render the subject of depreciation a secondary matter. But supposing that a gas-works blew up or a water reservoir burst, then there was a contingency which should be provided for. This could be done by means of a special reserve fund, available for the entire corporation, who might otherwise find themselves one fine morning in a very serious corner. Apart from this, he thought sinking funds were sufficient to cover all depreciation; but, of course, in trading concerns it was the first consideration to maintain out of revenue all the plant in thorough working order. If this were not done, obviously the earning capacity of the concern would be seriously interfered with. But when it had been done, and the sinking fund set apart, the profits should go to the borough fund. The allocation of such profits was dealt with by him in a paper read before the Society of Incorporated Accountants at Leeds in 1900, in which he suggested that there were three principal points for consideration. First, there was the ratepayer, whose credit to some extent had to be pledged in going to Parliament for power to set up the undertaking; secondly, there was the consumer, who assisted to make the whole thing a success; and, thirdly, there were the workers. These three bodies should be considered in every case of the apportionment of profits. As regarded workers, they had better hours and better conditions throughout the country when employed by corporations. It was also now a proved fact that consumers were better supplied and at a cheaper rate; and, further, there were still profits left that would, and should, go to the borough fund, under proper restrictions. Taking as an example Leeds, 1d. per 1000 cubic feet of gas there made a difference of £12,000; and it was impossible with 100,000 consumers to go into halfpennies and farthings per 1000 cubic feet, because the book-keeping involved would be so great. There must be either a profit or a loss; and obviously one would not allow that it should be worked at a loss, so that there must be a margin of profit. He had no sympathy with the argument that things must be always worked at actual cost price. There was no objection to corporations investing their sinking fund money in their own undertakings, and continuing the loans as they fell due. There could be no danger with regard to the repayment of loans, because the ratepayers were at the back of all the undertakings.

A statement by Mr. Wilson that the inquiries made by Parliamentary Committees were so complete that it was impossible for municipalities to set up any doubtful undertaking, drew from Lord Rothschild the sharp retort that the Committee on Municipal Trading would not have been sitting at all if there had not been some doubt in the minds of the public and a large number of ratepayers about a great many of these undertakings. In answer to this, witness said he did not think there was so much doubt as was sometimes made to appear; and though he was not in favour of municipalizing everything, yet as regarded things which had already been municipalized, he did not think Parliament

would ever interfere with them. If they did, they would make a mistake, because, so far as their genuine work was concerned, corporations were doing a great deal to regenerate the country. In Leeds, if it had not been for some of the trading profits, it would have been impossible to have removed slums and make other improvements, by which the death-rate had been reduced to less than one-half the figure at which it previously stood. There might be small matters which could well have been left alone; but it was conceivable that in dealing with big concerns like gas and water, a ring might be formed with regard to the sale of fittings, and that, as a corollary to a greater grievance, it might be necessary to ask Parliament to redress the lesser grievance by allowing corporations to sell fittings. Apart from these cases, small matters were better left to private individuals. Generally speaking, it would not be fair that a private trader should be forced to contribute to a rival scheme that might be very much against his business interests; but the principal work of municipalities did not touch small traders at all.

Mr. Platt-Higgins asked witness if he would be surprised to hear that the late Mr. Frank Crossley (who was the head of the large gas-engine firm of Crossley Bros.) had complained very bitterly that the Corporation of Manchester should be making what he regarded as an extreme profit out of the gas-works, which had the direct effect of injuring his own business. Witness said he could quite understand Mr. Crossley making such a complaint; but the position of Manchester was unique. It would not do for the Corporation to overlook the fact that they had a large amount of stock in the Ship Canal. Mr. Platt-Higgins: "This conversation I am speaking of was long before the time of the Ship Canal?" Witness: "It has been going on for a long time. I will not say it dates back to the year when Manchester took over its gas-works; but it is necessary for Manchester to keep the price of its gas at a certain figure to-day, in order to secure a certain amount coming in for the relief of the rates." Mr. Platt-Higgins: "I am not discussing the question of the Ship Canal at all. Before the question of the canal was raised, that was the remark made to me by Mr. Crossley. Do you think there is justification for it?" Witness: "With regard to Manchester, I should say 'Yes;' with regard to the kingdom at large, I should say 'No.' As I say, the position of Manchester is unique; but I do not admit it with regard to other towns." Mr. Platt-Higgins (referring to Mr. Wilson's contention that money for large improvement schemes could only be raised by the profits derived from trading adventures): "In your judgment, there is nothing wrong in money being raised for widening streets, even though it comes largely out of Mr. Crossley's pocket?" Witness: "It would not come out of Mr. Crossley's pocket alone."

Mr. William J. Jeeves, Town Clerk of Leeds.

The Town Clerk of Leeds said that he had heard the evidence of Mr. Gray and Mr. Wilson on the subject of auditors, and substantially agreed with both. After a lengthy examination on this subject and that of accounts, he was taken to the question of depreciation. Depreciation, he said, to be of any effect, must be in relation to the life of the undertaking; the idea being to provide a fund in some cases for necessary repairs and in others to replace the article when it was no longer in use, exactly in the same way that sinking funds were provided. The sinking fund, in effect, was to the corporation what the depreciation fund was to a company, because the Local Government Board periods varied from five to sixty years, according to the object of the loan, and the Board were always careful to name periods which were well within the life of the undertaking. When giving evidence before the 1900 Committee, he put in returns relating to a large number of boroughs; and these showed that at that date on water undertakings 29·48 per cent. of the expenditure twenty years earlier had been repaid by means of the sinking fund, while of the total expenditure up to that date roughly 15 per cent. had been repaid. Then as regarded gas, 45 per cent. of the expenditure twenty years earlier had been paid off at the date mentioned, and 30 per cent. of the total expenditure; and in the meantime the undertakings had been kept in thorough order out of revenue. In Leeds, at that date, they had actually provided by the sinking fund 20 per cent. of the total expenditure in respect of water; and a good deal of the outlay had been comparatively recent. They were under obligation to repay the balance in an equated period of 38 years. In the matter of gas, they had provided 26 per cent. of the total expenditure; and the balance had to be paid off in 32 years. He thought these figures compared favourably with similar ones that could be produced by the companies. Taking the case of gas companies, they could only accumulate a depreciation fund of 10 per cent. and an insurance fund of 5 per cent. They had to give the consumers all benefit apart from this; and therefore that was the extent of the reserve they could get. It was very desirable in some cases for corporations to have a reserve fund in addition to the sinking fund; but the amount of this, of course, depended upon the kind of undertakings dealt with and the extent of the sinking fund. In almost all cases it would be found that a certain reserve fund was provided; but the only need for it was to meet a sudden contingency—for example, the collapse of a gasholder. It would be impossible to re-borrow so long as any debt was outstanding in respect of the gasholder during the assumed life of it; and therefore it might be necessary to find the money in some other way. Witness explained the principle of the investment of the sinking fund; and, answering a question by Lord Rothschild, he admitted that the sinking fund of the Leeds gas undertaking might be used to develop electric lighting. Supposing a loan of £2,000,000 was issued for gas-works, and the sinking fund had accumulated to £400,000, if the Corporation were desirous of putting up electric light works they might, instead of borrowing £400,000 afresh, use the gas sinking fund for the purpose.

Witness said he wished to correct certain figures which Sir (then Mr.) George Livesey gave before the Committee in 1900. These figures, dealing with Leeds gas, were contained in a table which was based on "Field's Analysis." [This table was given in the "Journal" for July 24, 1900, p. 226, and showed the prices charged for gas by certain companies and corporations in 1883 and 1899. The figures for Leeds were: 1883, 1s. 9½d.; and 1899, 2s. per 1000 cubic feet. Those for Sheffield were: 1883, 2s. 3d.; and 1899, 1s. 9d. per 1000 cubic feet. It thus appeared that in the period named the price of gas at Leeds had been increased 2¼d. per 1000 cubic feet, while at Sheffield it had been reduced 6d. per 1000 feet.] Witness pointed out that Leeds gas was treated by way of comparison; and at the time he wrote to Sir George, and pointed out that he had not given proper figures—possibly owing to the fact that during the period mentioned Leeds had dropped out of the "Analysis," and Mr. Field had put another place in. As a matter of fact, the price of Sheffield gas in 1899 was 1s. 9·16d. per 1000 cubic feet, to which had to be added 1·13d. for meter-rent, as against the Leeds figure of 2s. per 1000 feet inclusive of meter-rent, and less a 5 per cent. discount, which was equal to 1·2d. The price at Sheffield was therefore 1s. 10·29d., as compared with 1s. 10·8d. for Leeds. Further, the comparison for Leeds between 1883 and 1899 was not correct. In 1883, the charge at Leeds was 1s. 10d., less 2½ per cent., which left 1s. 9½d., the figure given; and, in addition, at that period meter-rent was charged, which was equivalent to just over 1d. So that in 1883 the charge for Leeds ought to have been put as 1s. 10½d.; while in 1899 the price was 1s. 10·8d., which was substantially the same rate as in 1883—instead of, as Sir George Livesey said in his evidence, Leeds having gone up in price while Sheffield had gone down.

Mr. Platt-Higgins then questioned witness as to the fixing of the price of gas and the profit that should be made. Witness said that this matter had to be decided by the Council, who he thought generally settled it on the basis that the benefit of the corporation undertaking the business should be divided between the consumer and the ratepayer. It was absolutely essential nowadays for local authorities to have the prime necessities of manufacture supplied as cheaply as it was possible, in competition with other towns; and it was quite as important to a municipality to keep down the price of gas, water, and electricity as it was for them to keep down the rates. Turning to Manchester, he thought the evidence clearly showed that the result of the Corporation taking over the gas-works was that the consumer was getting his gas at a much lower rate than (judging by the experience of Liverpool, where there was a Company) he would otherwise have done. Corporations were able to borrow the necessary money at a much lower rate than companies; and the benefit of this lower rate was, generally speaking, divided between the consumer and the ratepayer. Mr. Crossley, however, whose name had been mentioned, apparently thought that the whole benefit of the corporate security ought to be given to the consumer. Mr. Platt-Higgins remarked that Mr. Crossley did not think anything of the kind; but witness replied that this struck him as the only principle on which his suggestion could have been based. Witness was next asked whether he was familiar with the Stalybridge and Mossley Gas Act of 1885, which referred to the taking over by the Corporation of the undertaking of the Stalybridge Gas Company, and in which a sliding-scale was imposed on the Corporation; and whether he would have any objection to the enactment of a general sliding-scale requiring all municipalities to divide their profits equally between the consumer and the producer. Witness said he would not like to answer this without seeing the clause; but in effect that was really what happened. For instance, in St. Helens there was always a very keen controversy as to what they should do with the gas profits. The Chairman of the Gas Committee always stuck up for the consumer, and the Council for the ratepayers; and it ended in a compromise. The amount paid to the borough fund was never increased unless the increase was accompanied by a reduction in price to the consumer. Referring to a statement in the Press last year that, while transferring £13,700 to the relief of the rates, the Bradford Gas Department owed their bankers no less than £67,225, witness said it would be better to manage without the overdraft if possible; but its existence might have been due to the fact that they wanted money on capital account, and it was not convenient to go to the market at the moment. He did not know whether the £67,000 was on capital or revenue account; but the possibilities were that it was capital, in which case there was proper administration. Mr. Platt-Higgins, referring to the Local Government Board inquiry at Halifax this year (see "Journal" for May 26, p. 534), said that the representative of the Halifax Ratepayers' Association pointed out that in the gas-works account the Corporation put down as an asset certain law costs amounting to over £14,000; and he asked witness whether he would regard this as a kind of liquid asset of the Corporation. Witness replied that this entirely depended upon the circumstances. Supposing a person defended a patent and won, would he not say that the cost represented the value of the patent to him? Would it not have to go to the capital account of the patent in the books? Mr. Platt-Higgins said if a man was trading as a private person with his own money, this would be perfectly legitimate; but should the same rule apply (say) to the Liverpool Corporation? Witness replied that he should adopt the same method. If it was a proper amount to be charged to the year's gain of a private trader, he should say it ought to have been so charged by a corporation; but if, on the other hand, it was a thing that ought in the one case to have gone to capital, then in the other it might very well have been treated in the same way. Mr. Platt-Higgins: "Another ratepayer said there appeared a sum of £109,000 for retorts, retort-houses, and general works; and he asked how much of that property remained. The answer given was: 'I do not think any of those buildings are left; the works have been remodelled, and the old buildings which were falling have been pulled down.' Would you think this £109,000 was a good asset in the balance-sheet?" Witness: "I am quite sure that you could not have built the new works out of capital without having provided for the earlier expenditure by means of a sinking fund—that I am quite sure would be the position; and if that is the position, it is including an asset twice over, and would not be the right thing. But it depends on the facts."

Mr. H. Sherley Price, M.Inst.M.E.

Evidence on the question of the depreciation of plant and physical effects was tendered by Mr. H. Sherley-Price, a member of the firm of Wheatley, Kirk, Price, and Co., engineering valuers. Witness said that the life of every part of a manufacturing plant or undertaking, except the land upon which it stood, was limited; and prudence dictated that suitable provision should be made so that the units forming the concern should only appear in the assets at their actual worth as such, regardless of original cost. For example, take the case of an

electric light station erected (say) ten years ago at a cost of £50,000; he would be a bold man who would say that the actual value of such a concern to-day would be anything like half this amount. If no provision had been made to meet this depreciation, the profit and loss account would be wrong to that extent. The sinking fund applied to municipal trading was a provision for repayment of loan capital, and was not connected with depreciation. The question of depreciation, of course, applied more particularly to electric lighting and power stations, traction, and gas—such manufacturing operations as were carried on at a profit, or supposed profit. It affected water-works to a far less extent. In the case of Liverpool, for instance, if the Lake Vyrnwy works were maintained, the depreciation over and above this would be more than compensated for by the appreciation of the land. There was only one way in which the actual amount of depreciation could be arrived at; and this was by personal inspection at stated periods by an expert valuer. He had not heard of any corporation adopting a periodical valuation of their plant; but it was a practice with many large engineering firms. Such an inspection should take place annually so that the auditor's account or the balance-sheet should also embrace the valuer's report. He would not, of course, suggest that the Thirlmere water-works at Manchester should be inspected annually; but he would apply the system to electric lighting and traction concerns, and perhaps also to gas. Engineering firms who had adopted the plan of periodical inspection and valuation were practically entirely managed by experts, who gave their life to the work; and if they found it necessary to bring in an independent expert to write off depreciation, it was surely still more necessary in the case of the huge undertakings which were managed by local committees without technical knowledge. He thought the valuer should be appointed by the Government, and not be subject to local influences. He could not conceive how a man could be entirely independent (as he should be) if his fees were to be paid by the people whose effects he was valuing. The course he suggested would not entail on the Government any large expense; and he put it forward as a solution of the question of depreciation. Owing to recent inventions, he certainly thought they must look forward to a more rapid depreciation in the future than had been experienced in the past.

Mr. JOHN E. ASTILL.

The last witness examined at this sitting of the Committee was Mr. J. E. Astill, who appeared on behalf of the Battersea Municipal Alliance—a body of ratepayers who feel that local affairs are administered in a very extravagant manner. Witness pointed out that in 1890 the municipal debt of Battersea was £37,000; while now it was £556,235—or seventeen times as much. Then in the former year the rates were 5s. 6d. in the pound, as against 7s. 11d. at present. Most of the money was raised by loan from the London County Council, who made a small profit on the issues; and he thought it was rather unwise that the lending authority should have the opportunity of making a profit on the loans they granted—it was an inducement to them to encourage such issues. He did not go so far as to say that they did encourage them; but he thought they probably made £25,000 per annum profit on the loans they had granted to the Metropolitan Boroughs. In regard to the electricity undertaking, witness said this was used almost solely for lighting purposes. The working expenses from March, 1901, to March, 1902, were £4243, interest on loans £3429, and principal repaid £380—making a total of £8052; and as the revenue for the year was £4203, there was a loss of £3849. Since the undertaking was started, there had been a loss to the ratepayers of £9012. No allowance whatever had been made for depreciation of the plant. Though he was not opposed to municipalities undertaking electric lighting where it might become of use to the majority of the inhabitants, in Battersea very few people had the means to take it. The cost of the current was considerably more than that of other illuminants; and the majority of the ratepayers were so poor that they could not afford to install the light. There were only very few—probably not twenty of the private residents—who had taken it up, and also some few of the well-to-do shopkeepers. The smaller tradespeople of Battersea and the poorer section of the community, who had not the means to avail themselves of the electric light, were therefore in the unenviable position of having to pay a penny rate to the few users who had the enjoyment of it. Of course, they all had the benefit of the public lighting; but this was very small, because it was only the few main thoroughfares that were electrically lit.

ALLIANCE AND DUBLIN GAS COMPANY.

Half-Yearly Report and Accounts.

The accounts of this Company for the half year ending the 30th of June, which will be presented at the general meeting to be held on Thursday, show that the revenue from the sale of gas amounted to £107,968, the rental of ordinary meters to £3439 and of coin meters to £14,226, the returns from residuals were £24,477, and the total receipts were £150,485. The expenditure on the manufacture of gas was £68,864 (coal costing £30,905, and cannel and oil £19,007); on distribution, £17,107; and on management, £5427—the total expenses being £104,490. The balance carried to the profit and loss account is £45,995. Deducting from this sum £5879 for interest on the debenture stock, there remains a balance of £40,116; and the Directors recommend the payment of the usual dividends at the rates of 10½ and 7½ per cent. per annum on the respective shares. The reserve fund has been increased by £3000, and the contingent and suspense account by £2000. There was an expenditure of £7775 on capital account during the six months; £3453 being for new mains and service-pipes, and £2473 for new and additional automatic meters and fittings. There were 42,907 tons of coal, 1173 tons of cannel, and 1,187,568 gallons of oil employed in the manufacture of 775,905,000 cubic feet of gas, of which 691,318,000 cubic feet were sold and 699,831,000 cubic feet accounted for. The residual products were: Coke, 56,171 chaldrons; breeze, 5706 chaldrons; tar, 574,508 gallons; and ammoniacal liquor 825,989 gallons.

SHREWSBURY GAS COMPANY.

The Annual Meeting of the Shrewsbury Gas Company was held last Wednesday, under the presidency of Mr. W. BEACALL, the Deputy-Chairman.

The report stated that the profit on the working for the year ending June 30 amounted to £6538. An interim dividend of 2½ per cent. was paid in March last; and the Directors recommended that the authorized dividend of 5 per cent. for the year be declared (payable, less the interim dividend, on Sept. 29), after providing for which, and for interest on mortgages, there would be a balance in the profit and loss account of £1141 to carry forward. The reserve fund amounted to £8426, and was fully invested in Consols. The Directors further stated that there had been an increase of about 3 million cubic feet in the consumption of gas during the year, though the winter season was the mildest for many years. The unaccounted-for gas had been further reduced from 6·38 to 5·78 per cent. The quality and purity of the gas had been maintained above the parliamentary standard. The number of stoves on hire at June 30 was 1606, an increase of 336 in the year; and the number of slot-meters in use was 2270, an increase of 344. Both these conveniences were much appreciated, and were still in good demand. They asked for authority to raise further capital to meet part of the expenditure on the additional works referred to in the previous report. These were commenced last November, and were now in a forward state. They were expected to be in full operation early in the coming winter, and to provide for an increase of 50 per cent. in the manufacturing capacity.

The CHAIRMAN, in moving the adoption of the report and accounts, said the past two years had been a period of some anxiety to those responsible for the management of the Company. Two years ago it became apparent that a time was close at hand when the requirements of the town, as far as gas was concerned, would exceed the Company's means of supply. The matter was very carefully considered by the Directors; and it was decided to erect additional works on the Company's reserve ground. Plans of the proposed works were prepared by the Engineer (Mr. William Belton); and under his invaluable superintendence, those works had been carried to very near completion. The Directors had every reason to hope that the works would be ready to meet the extra strain which would be put upon the Company as the winter came on. They would provide, as the report indicated, for an increase of 50 per cent. in the manufacture of gas, which would probably serve for some time to come, though such was the growing use of gas that the most far-seeing among them would, he thought, hesitate to say for how long. The new works had been pronounced by those well able to judge in such matters as second to none in the kingdom; and he thought it would be apparent to anyone who took an interest in things of the kind, and would examine them, that for design, simplicity in working, and adaptability to the purpose for which they were intended, they must be difficult to improve upon. This he regarded as by far the most important work of the Company during the past year. With respect to the balance-sheet and their financial position, a very few words would suffice. As the shareholders knew, a material reduction in the price of gas was made in the commencement of the year. Notwithstanding this, the profit on the working was larger than it was in the preceding year. Full dividends and other regular charges had been provided for, leaving a reasonable sum to be carried forward in the profit and loss account. The balance-sheet showed far more effectively than words of his could do the progress the Company were making, and the thoroughly sound position in which they stood.

The motion having been unanimously carried, and the dividend recommended declared, votes of thanks were accorded to the Chairman and Directors and the Secretary and Engineer; a tribute being paid to the skill with which the latter had carried out the new works.

At an Extraordinary Meeting which was subsequently held,

The CHAIRMAN moved that, in conformity with the Shrewsbury Gas Act, 1901, the sum of £20,000, including premiums, of additional converted stock be created. He said the shareholders knew that the Directors were empowered to authorize the creation of certain blocks of stock at certain intervals. They had one block of £20,000, and now they asked them to authorize the issue of another £20,000. It was not the intention of the Directors to put this amount on the market all at once. He should think that about £10,000 would probably clear all they would want for the present and for some little time to come. But there was no good reason at all why power should not be taken to raise the £20,000—in fact, there was every reason why it should be raised; and the Directors would use their discretion at what times and seasons the remainder should be called up.

The resolution was carried.

On the motion of the CHAIRMAN, it was further resolved that the Company be authorized to obtain the sum of £6666 upon mortgage, when the £20,000 of additional stock had been issued and fully paid up.

BOURNEMOUTH GAS AND WATER COMPANY.

Progress of the Undertaking.

Some of our readers may have noticed that the columns of the "JOURNAL" for the 1st inst. contained an unusual feature in the shape of a report of the proceedings at the half-yearly meeting in London of the above-named Company. Previously, these gatherings had been held in private; but that there was nothing in connection with the management of the Company which would not bear making public was fully revealed by the satisfactory character of the report and accounts presented on the occasion referred to. The payment for some time past of a dividend at the rate of 13 per cent. per annum on the original shares, and the prospect of something more as the result of growing business, is a condition of things upon which Directors and shareholders alike should congratulate themselves. The undertaking has lately entered upon a period of extended usefulness, inasmuch as its area has been enlarged by the addition of the neighbouring borough of

Poole; and the Company have just obtained further parliamentary powers, the nature of which is indicated in the notice of the new Act which appears in another column. Increased business, as the Chairman of the Company (Mr. G. Crispe Whiteley) pointed out at the meeting, necessitates further expenditure; and therefore, as will be seen by our advertisement pages, the Directors have taken steps to augment their capital by the issue of 1000 "B" 7 per cent. shares, under the provisions of their Act of 1896. This extra capital outlay, as Mr. Corbet Woodall remarked, conserves and strengthens the position of the undertaking better than anything else; and therefore the shareholders have no cause for disquietude in regard to it. In view of the larger scope of the Company's operations in future, the following particulars, sent to us for publication, may not be without interest.

From its early days, the Company was presided over by the late Mr. C. R. Mead, since whose death (in 1897) the chair has been ably filled by Mr. Whiteley, the Senior Director. To the Chairman of a flourishing Company, much honour is due, though not alone to him and the Board can the success of an important commercial and engineering undertaking be attributed. Very much depends upon the engineer who designs, and the managing staff who work, the plant. Mr. Edward Woods, whose recent death was touchingly referred to by the Chairman at the last general meeting, and who was one of the founders of the Company, became the Engineer, and nominally held the post until his decease. His great age, however, prevented him undertaking much of the Company's work during the period of its most rapid growth. Consequently, about 1886, Mr. Corbet Woodall (now one of the Directors) was called in to design a two-lift gasholder and a retort-house.

From the year 1900 onwards, practically the whole of the gas engineering, and a great part of the water engineering, has been in the hands of Mr. F. Southwell Cripps, who has designed and carried out work for the Company costing upwards of £160,000, including a three-lift gasholder. The large retort-house and coal-stores, coal-shoots and staging, purifying plant, buildings, &c., are all to his designs, and were carried out under his superintendence. One of his most recent works for the Company has been the addition of a third lift to the gasholder before alluded to—the capacity being increased without raising the guide-framing.

In 1894, Mr. Cripps devised the new scheme of water supply to the town. The carrying out of this work was entrusted partly to Mr. Woods and partly to Mr. Cripps; the former undertaking the new pumping machinery and reservoir, and the latter the new well, and the connections therefrom to the existing system. The new well was sunk in the chalk at a point just beyond Wimborne, and on its completion was visited by the Mayor, the Town Clerk, and the Surveyor of Bournemouth, in company with the Directors, on Dec. 7, 1900. They found it to be an interesting piece of work. Mr. Cripps conducted the party through the underground tunnels, nearly half-a-mile in length, along which the water rushes to the well at the rate of from 2 to 3 million gallons a day. The well is 200 feet deep. This work, together with the large connecting mains and accessories, cost no less than £60,000. If to this is added the cost of the pumping plant and the reservoirs, it may be imagined that a great deal of money has been spent to secure so magnificent a supply of pure water.

With the exception of gas-mains for coupling up the recently acquired district of Poole, very little has been spent on extensions in the Gas Department during the past few years. What work has been done has been carried out by the Resident Engineer and Manager, Mr. Harold Woodall, to whom much praise is due for the able manner in which he has expanded the Company's business since his appointment as successor to Mr. W. J. Fuller about three years ago. The most recent development has been the amalgamation with the Poole Gas Company, by which, as already mentioned, the Bournemouth Company's already very large area of supply has been considerably augmented. Notwithstanding many years' competition with the Electric Light Company, the business has rapidly increased; and, from what was stated at the recent meeting, there is every prospect of a continuance of its growth.

LINCOLN CORPORATION ACCOUNTS.

Mr. J. H. Burgess, City Accountant of Lincoln, has just issued his abstract of the accounts of the Corporation for the year to March 31. From this it appears that the income of the gas-works was £44,160, of which £32,751 was for the sale of gas (£2298 being for public lighting), £10,701 for the disposal of residual products, and £706 for rent of cookers. On the other side, the manufacture of coal gas cost £26,392, and of carburetted water gas £1467, distribution accounted for £1695, management expenses for £1438, expenses in connection with cooking apparatus £492, rates and taxes £1857, and miscellaneous items £181. This made a total of £33,526; the gross profit being £10,634. To this had to be added the balance of £1940, making the income on profit and loss account £12,574, which has been disposed of as follows: To redemption of debt £1880, dividends and interest £6159, cooking apparatus £692, renewals and extensions £288—total £9019; leaving £3555, which, by resolution of the Gas Committee, has been transferred to the reserve fund, which now stands at £9996. The water revenue amounted to £12,918, made up as follows: Water-rentals: Domestic purposes, £9146; supplied by meter, £3528; water for building purposes, £113; while £129 for work, rent, &c., completes the total. There is nothing abnormal in the expenditure; maintenance of works (including wages, &c) amounting to £1066. Distribution, including coal and cartage (£1252), accounted for £2206, rates and taxes absorbed £1783, and there were other smaller items bringing up the total expenses to £5772, and leaving a gross profit of £7145. There had to be added to the last-named sum £5668, the balance in hand at March, 1902, and bank interest £185—making a total of £13,000. Against this had to be placed £1957 redemption of debt, £3189 interest and dividends, £691 extension of mains, and £1000 grant in aid of the rates. This made a total of £6838, and left a balance to credit of £6161. On capital account the payments included £3450 in respect of boring for water, and £1808 in respect of new filter-beds.

LEEDS CORPORATION GAS DEPARTMENT.

Annual Report.

The report of the Leeds Gas Committee on the working of the department during the past year states that there was a net profit of £35,278 on the trading; and after setting aside the sum of £24,260 for redemption fund purposes, there remains a surplus of £11,018. On March 25, the redemption fund amounted to £395,862, of which sum £160,525 has been applied to the repayment of debt. Compared with the previous year, the income from the sale of gas, residuals, and sundries has increased by £9123; while on the expenditure side of the account, the cost of coal has decreased by £12,325, and other expenditure by £13,514. Owing to extensions and improvements that have been effected, the capital account has been increased by the sum of £91,446. Of this amount, £6106 has been expended on the Meadow Lane works (where £4973 17s. 6d. has been spent on land and property), £1612 on the New Wortley works, £23,086 on the York Street works, £22,508 on carburetted water-gas plant at Dewsbury Road, £1429 on gasholders, £20,913 on mains and services, £10,167 on meters, and £5622 on stoves. The amount standing to the credit of the capital depreciation fund on March 25 for gas-stoves was £13,888. The quantity of gas made for the year ended June 30 was 3,173,877,665 cubic feet—a decrease of 0·96 per cent. on the previous year. The diminution is explained by the mild weather which was prevalent last winter. The coal and cannel used was 299,100 tons, as against 302,812 tons—a decrease of 3712 tons, or 1·22 per cent. The quantity of gas sold, including that used on the works, gasholder stations, &c., was 2,896,684,120 cubic feet, against 2,901,462,366 cubic feet, or a decrease of 1·09 per cent. The make of gas per ton of coal has been a record; the figures being 10,611 cubic feet, compared with 10,583 feet. The quantity sold per ton has also been larger than in previous years; the return being 9594 cubic feet. During the year, 43,458 yards of mains were laid for the supply of gas to new streets, and 5149 yards in place of smaller and defective ones, varying in size from 2 to 24 inches; the total being 27 miles 1087 yards. The number of meters fixed to supply gas to new customers was 12,573; while 9638 were returned, and 9272 exchanged. The meters repaired numbered 5951 of all sizes, as compared with 5654 in the previous year. For gas-engines, stoves, automatic stoves, and automatic meters, there has been a great demand—especially for penny-in-the-slot meters. Of these, there are 5278 more in use than was the case last year; while there are 2075 additional automatic stoves. The average illuminating power of the gas during the year ending June 30 was 18·40 candles.

GAS COMPANIES AND THE FISCAL QUESTION.

Further Remarks by Mr. H. A. Willey.

Speaking at the Half-Yearly General Meeting of the Exmouth Gas Company last Tuesday on the successful working of the undertaking in the six months ending the 30th of June, which resulted in a balance of £1318 carried to the profit and loss account, Mr. H. A. Willey took the opportunity of offering a few remarks on the great fiscal question now before the country, which, he said, would have an important bearing on gas companies. On the one hand, a large section of the public were pressing for Protection; and, on the other, people were asking for a continuance of the present system of free imports, though he believed that the great mass of the people were suspending their judgment until the whole of the case had been placed before them by politicians. He had stated elsewhere that the fact of any alteration of their tariffs could not be disregarded by gas companies. By manufacturing themselves articles which they were purchasing at present from abroad, and which were the direct products of foreign labour, a greater amount of employment, and consequently more prosperity, must ensue to the working classes of the country. The use of gas for lighting by the wealthy, if not stationary, was in some places on the decline; so that, in order to maintain the sale of gas to ensure a return for the vast amount of capital invested in this country, it had long been the policy of gas administrators to cultivate its use among the working classes, to whom the electric light, at its present cost, was impossible. There were certain facts not to be gainsaid. One was that many British industries were extinct, and many others were rapidly waning. The cotton-mills in Lancashire were, in consequence of foreign competition, working three quarter time; and the loss of wages to the working classes might be measured, not by thousands, but by millions of pounds per annum. It was obvious that if the workmen lost their employment, or had their wages reduced, the sale of gas in their homes, whether by the prepayment or the ordinary meter, for lighting and cooking purposes, must decline. He was pleading with their own Company, and with others where he had any influence, to support those who desired to institute a thorough inquiry into the question, not only for the reasons advanced, but for another most important one. He asked the shareholders whether they could imagine what extraordinary margin of profit there would be in England for their gas-works residual, sulphate of ammonia, for farming purposes, if it were possible to revive the great agricultural interests and farming operations in the country. In the opinion of many practical business men, the whole system needed revision, the laws should be altered, and a Minister of Commerce appointed to look after the commercial interests of the country. The policy of all gas companies was to reduce the cost of the production of gas to the uttermost farthing, and to sell it as cheaply as they possibly could, so that when the day came, which it might at any time, that electricity was found available, through slot electricity meters and as a medium for cooking, the gas companies would be prepared to meet such competition with a cheaper article, so that gas might remain predominant in the market of artificial illuminants.

FOLLY OF FELIXSTOWE DISTRICT COUNCILLORS.

Students of human character will find some eccentric specimens among the members of the Felixstowe Town Council. This little East Anglian seaside resort has been growing in popularity; and this has apparently so turned the heads of those to whom the governing of the town has been entrusted that their reasoning power has been slightly affected, with the result that, unless the Local Government Board at once put a check upon them, the councillors themselves will succeed in putting a check upon the progress of the town. We are impelled to the making of these observations by the only conclusions to be drawn from a careful observation of the strange project to which they, in their pitiable inability to comprehend what is most likely to be the issue of their act, are prepared to bind the ratepayers. It is the electric light over which they have lost their business balance. They are like the moth which, fascinated by a brilliant light, flutters about it until its wings are singed. We will not carry the simile farther by suggesting that, as generally happens in the case of the moth, the singeing will end in total destruction; but it looks safe enough to predict that what the Felixstowe councillors are now doing will, if allowed, have a decidedly detrimental effect upon the prosperity of the town. Far better would it be if the councillors would spend the thousands of pounds they are now proposing to sink, and sink unprofitably, in improving the attractions and conveniences of the town. The case of Felixstowe is an interesting one; and a little publicity may be of advantage in causing other towns to hesitate in following the peculiar example until, at any rate, they see whether—given the chance—Felixstowe will come out of it unscathed. But such a happy issue as this is so problematical that there is plenty of ground for confidence in predicting that, if the councillors have their way, the ratepayers will before many years pass find themselves in anything but a comfortable plight.

It was in 1900 that the District Council first began to flutter around the electric light; and they then obtained a Provisional Order. Already the town was being supplied, and is now, by the Suffolk Electricity Company. But this Company had no parliamentary powers; and so they were practically at the mercy of the Council after the granting of the Order. But there is no doubt the salvation of the Company is to be found in the fact that on the Council they have one Director and two shareholders, who, it may be assumed, have influence with their fellow councillors. Negotiations took place between the Council and the Company, after the Order was obtained; and, in connection with these, Sir William Preece was consulted. In the light of what is now happening, his report has considerable interest. Precisely what the Council are proposing to do now he then described as "foolish." Therefore we have expert authority, paid for by the Council, for writing as we have done in the opening paragraph. We will return to Sir William's report presently, leaving it for the moment with the one remark that his advice was not at all of the kind the Council wanted; and therefore they paid him his fee, and dispensed with his services.

Then last year the Council, still blinded by their fascination, consulted a gentleman of less eminence in the electrical world than Sir William Preece. This, we think, Mr. Reginald P. Wilson will himself be disposed to admit. Whether he will do so or not, does not matter. The facts remain that he reported in a manner that did please the District Council; that he is still in their service as their Consulting Engineer in this matter; and that he advised them contrary to Sir William Preece. As a result, what the Council have done is this: They have applied to the Local Government Board for permission to borrow £17,160 for electric lighting, repayable within a period of 25 years. Now how is this money to be disposed of? The Council propose to purchase the plant, works, machinery, &c., of the Electric Light Company, under the conditions that the latter are to carry on the works for 25 years, and the Council are to have the option of terminating the agreement at the end of 15 years. If the Council take over the works at the end of the shorter period, they are to pay the Company for their loss of profit (*sic*) during the unexpired term of the agreement, a sum equal to 2½ per cent. per annum on the then capital outlay. The purchase price is to be £8000, £5000 of which is to be paid within three months of the Local Government Board's sanction to the loan, and the other £3000 is to be retained by the Council until the Company's balance-sheet in any one year shows a profit of 6 per cent. Mr. Wilson considers that extensions are immediately imperative to the extent of £7600, which, with contingencies, will run up to £9160. Now adding to this the £8000 purchase money, we arrive at once at the total exhaustion of the loan of £17,160. But the Council have to find all the money for future capital expenditure; and that is, as other electric lighting undertakings have shown to the disturbance of the equanimity of their communities, an unknown quantity. What the ratepayers are in for, if the scheme is carried out, can only be imagined; it cannot possibly be computed. The Council cannot borrow the money under 3¾ per cent. In return for their generosity, the Company are to pay them 6 per cent. on the capital; but this amount the Council themselves admit will not cover the interest and repayment of the loan. The loss to come out of the rates on the present loan alone will total in the 25 years to £1300. But what of further capital expenditure? It does not look as though the loss of £1300 is to be the end of it, besides which the prospect of the Company being able to earn the money to pay the 6 per cent. is a very remote one. It is true that the same Company are supplying Diss and Stowmarket; but it is unlikely that the consumers of these two towns will consent for long to pay a price for electricity sufficient to make good the financial shortcomings of the Felixstowe undertaking. But more upon this question of prospects directly. This, in brief, is the strange scheme which we have well described as the folly of the Felixstowe District Council.

Let us go farther. The Company have an overhead wire system; and the Council are not going to take these wires over. But they are to have the use of them, and have obtained the sanction of the Board of Trade to their continuance for five years. After which, we take it, there must be more expenditure in putting them underground. Poor

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 805.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	April 17	10½	Alliance & Dublin 10 p.c.	19½–20½	+½	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13–14	..	5 7 2
200,000	5	May 14	6½	Bombay, Ltd.	5⅝–6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4–4½	..	5 15 7
380,000	Stk.	Aug. 13	12	Brentford Consolidated	235–240	..	5 0 0
300,000	,,	,,	9	Do. New	173–178	..	5 1 1
50,000	,,	,,	5	Do. 5 p.c. Pref.	150–135	..	3 14 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	105–110	..	3 12 9
220,000	Stk.	Sept. 11	10⅝	Brighton & Hove Orig.	207–212	..	5 0 2
246,320	,,	,,	7½	Do. A. Ord. Stk.	141–150	..	5 3 4
460,000	20	Mar. 31	10	British	39–40	–½	4 18 8
100,000	Stk.	Aug 13	6	Bromley, Ord. 5 p.c.	115–120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	88–93	..	4 16 9
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	10⅞–11¼	..	6 4 5
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93–95	..	4 4 3
150,000	20	July 10	8½	Cagliari, Ltd.	21–24	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½–15½	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52–54	..	5 11 1
1,375,000	Stk.	Aug. 27	5 7/16	Commercial Old Stk.	105–108	..	4 16 3
503,750	,,	,,	5	Do. New do.	100–103	..	4 17 1
442,947	,,	June 11	3	Do. 4½ p.c. Deb. do.	87–90	..	3 6 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	120–125	..	5 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	135–140	–2	5 0 0
575,000	Stk.	Aug. 27	5⅜	Crystal Palace Ord. 5 p.c.	112–117	..	4 11 1
60,000	,,	,,	5	Do. 5 p.c. Pref.	118–123	..	4 1 4
112,533	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135–138	..	3 12 6
486,090	10	July 29	10½	European, Ltd.	17⅝–18½	..	5 13 6
354,060	10	,,	10½	Do. £7 10s. paid	12½–13½	..	5 16 8
15,243,200	Stk.	Aug. 13	4 1/16	Gas-light and Coke: 4 p.c. Ord.	83–85	–2	5 3 7
2,600,000	,,	,,	3½	Gas-light and Coke: 3½ p.c. max.	84–86	..	4 1 5
3,799,735	,,	,,	4	Gas-light and Coke: 4 p.c. Con. Pref.	103–106	..	3 15 6
4,193,975	,,	June 11	3	Gas-light and Coke: 3 p.c. Con. Deb.	87–89	..	3 7 5
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90–95	..	5 5 3
70,000	10	June 11	8	Hongkong & China, Ltd.	15–16	..	5 0 0
3,800,000	Stk.	May 14	10	Imperial Continental	195–200	–4	5 0 0
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.	99–102	..	3 8 7
165,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	113–118	..	5 1 8
561,000	Stk.	,,	10	Liverpool United A	214–216	–1	4 12 7
718,100	,,	,,	7	Do. do. B	162½–4½	..	4 5 1
306,083	,,	June 26	4	Do. do. Deb. Stk.	110–112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd.	4¼–4¾	..	5 5 3
560,000	100	April 1	5	Met. of 5 p.c. Deb.	103–107	..	4 13 6
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102–104	..	4 6 7
541,920	20	June 11	3½	Monte Video, Ltd.	9–10	..	7 0 0
1,515,892	Stk.	Aug. 13	4½	Newc'tle & G'tesh'd Con.	103¾–104½	+⅛	4 6 2
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.	98–99	–½	3 10 8
300,000	Stk.	May 14	8	Oriental, Ltd.	140–145	..	5 10 4
600,000	5	Sept. 11	7	Ottoman, Ltd.	⅞–6⅞ * Ex div.	..	5 7 8

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	June 26	6½	Ply'mth & St'house 5 p.c.	123–128	..	4 15 8
851,070	10	April 30	7	River Plate Ord.	11⅛–11⅜	..	5 19 2
300,000	Stk.	June 26	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
250,000	10	April 17	8	San Paulo, Ltd.	11–12	–½	6 13 4
135,000	Stk.	Sept. 11	10	Sheffield A	234–237	..	4 4 5
209,984	,,	,,	10	Do. B	232–235	..	4 5 1
523,498	,,	,,	10	Do. C	232–235	..	4 5 1
103,235	Stk.	Mar. 31	5½	Shrewsbury Ord. 5 p.c.	111–114	..	4 7 9
6,150,000	Stk.	Aug. 13	5⅓	South Met., 4 p.c. Ord.	115–118	–3½	4 6 0
1,780,000	,,	July 10	3	Do. 3 p.c. Deb.	87–89	..	3 7 5
380,940	Stk.	May 14	5	Southampton Ord.	105–110	..	4 10 11
87,950	,,	July 10	4	Do. 4 p.c. Deb.	102–105	..	3 16 2
120,000	Stk.	Aug. 27	6	Tottenham and Edmonton: A. 5 p.c.	115–120	..	5 0 0
313,020	,,	,,	4½	Tottenham and Edmonton: B. 3½ p.c.	95–100	..	4 10 0
182,380	10	June 11	8	Tuscan, Ltd.	8–9	..	8 17 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	98–100	..	5 0 0
737,142	Stk.	Aug. 13	5	West Ham, 5 p.c. Ord.	93–98	..	5 2 10
				WATER COMPANIES.			
780,776	Stk.	June 26	11⅛	Chelsea, Ord.	305–315	..	3 13 0
150,000	,,	,,	5	Do. 5 p.c. Pref.	147–150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	135–138	..	3 5 3
175,785	,,	Mar. 31	4½	Do. 4½ p.c. Deb.	137–142	..	3 3 5
1,720,560	Stk.	Mar. 31	8	East London, Ord.	205–215	..	3 14 5
654,740	,,	June 11	4½	Do. 4½ p.c. Deb.	138–143	..	3 2 11
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	92–95	..	3 3 2
700,000	50	June 11	10	Grand Junction: 10 p.c. max.	122–127	..	3 18 9
310,000	Stk.	Mar. 31	4	Grand Junction: 4 p.c. Deb.	123–128	..	3 2 6
708,000	Stk.	Aug. 13	10½	Kent	275–285	..	3 13 8
160,000	,,	,,	7	Do. New, 7 p.c. max.	190–200	..	3 10 0
1,043,800	100	June 26	11	Lambeth, 10 p.c. max.	292–297	..	3 14 0
406,200	100	,,	8½	Do. 7½ p.c. max.	210–220	..	3 17 3
350,000	Stk.	Mar. 31	4	Do. 4 p.c. Deb.	122–127	..	3 3 0
500,000	100	Aug. 13	12 10/20	New River, New Shares	385–395	..	3 4 9
1,000,000	Stk.	July 29	4	Do. 4 p.c. Deb.	121–124	..	3 4 6
902,300	Stk.	June 11	7½	South-wark and Vauxhall: Ord.	225–235	..	3 3 10
126,500	100	,,	7½	South-wark and Vauxhall: 7½ p.c. max.	210–220	..	3 8 2
489,200	Stk.	,,	5	South-wark and Vauxhall: 5 p.c. Pref.	145–150	..	3 6 8
1,019,585	,,	Mar. 31	4	South-wark and Vauxhall: 4 p.c. A Deb.	122–127	..	3 3 0
1,155,066	Stk.	June 11	10	West Middlesex	270–275	..	3 13 9
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	136–141	..	3 3 10
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb.	92–95 * Ex div.	..	3 3 2

ratepayers! In his report of 1901, Sir William Preece strongly urged that the wires should be placed underground. In passing, it is also interesting to note that, while he advised the erection of twelve arc lights (half on the Parade and half in the public gardens), he stated that gas-lamps, especially when supplied with Welsbach mantles, were quite good enough for street and road lighting. In the extensions of the plant, too, he advised "under the special circumstances of the case," the employment of gas-engines rather than steam for general purposes. But these are matters upon which we need not enlarge; our object being to show here the ridiculous nature of the venture that the councillors are willing to submit the town to, contrary to the advice of Sir William Preece, but countenanced by an engineer whose recommendations coincide with their wishes. Remember £8000 is the purchase price. In 1901, Sir William characterized a suggested price of £6000 as "a fancy one." He valued the plant at £1500 (the Company have since spent about £1000 in extensions); and the land and buildings at £500, which left no less than £4000 for the overhead wires, meters, house connections, and goodwill! Sir William showed clearly that the Council, having secured a Provisional Order, had it within their power to largely destroy the Company by competition; but he proposed what appears (without raising any question as to the policy of the Council entering into this speculative business) to be perfectly fair, under the conditions of the Company, and that was that the Council should purchase the undertaking at any time by paying the fair market value of the concern as set out for the compulsory purchase of undertakings in the Electric Lighting Act of 1888, with the additional payment, in lieu of goodwill, if the purchase took place within 7, 14, or 21 years, of respectively £500, £400, and £250 for every 1000 8-candle power lamps, or their equivalent, connected to the mains. But Sir William must have had some inkling as to what was in the minds of some of the councillors; for towards the close of his report he says: "The Urban District Council of Beckenham have made a strange bargain with an outside firm. They possess and retain the Provisional Order and find the capital. The private Company do all the work, take all the profits, and pay the interest and sinking fund charges. The Council earn nothing, but are saved any payment for interest, &c. . . . I cannot recommend the Felixstowe Urban District Council to make such a foolish bargain." Yet now, under the advice of Mr. Wilson, the Council are proposing to do something worse. They are actually on immediate and compulsory expenditure proposing to incur a loss, without taking into account the prospective capital expenditure, and the risk of the Company being able to make sufficient profit to pay them their 6 per cent. Where the sense of this arrangement comes in, we cannot see. The Company are, it is quite manifest, glad enough to get rid, with but little loss of capital, of an undertaking that is hedged round by difficulties and large prospective expenditure. The throwing of the onus of providing all future capital upon the ratepayers matters not to them so long as they can finger £5000 of the money they have already spent.

There is no need to examine the report made by Mr. Wilson. Its tenor is the curious scheme of which we have already supplied the heads. But we will briefly look into the question of what are the prospects of the Company ever being able to earn the 6 per cent. interest which they have to pay the Council, and which is insufficient for the latter to meet their liabilities in respect of interest and repayment of the loan. On this point, the information must be gathered from the Local Government Board's inquiry a few days since into the application of the Council for sanction to the loan of £17,160. It will not be surprising to learn that the Gas Company (being largely interested as ratepayers) were among the "considerable number" of ratepayers who opposed this insensate scheme of the Council. It was brought out in evidence that the fully-paid capital of the Company is £7420; and that they have overdrawn at the bank to the extent of £600. Now in the four years the Company have been in existence they have secured 165 consumers; and the connections are equivalent to 4500 8-candle power lamps. It may therefore be assumed that the Company have already obtained the cream of the consumers who are anxious for the electric light at the high average price of 7d. per unit, which it is proposed now to increase to 8d. per unit in the three summer months, and to reduce to 6d. per unit in the other nine months. The increase in the summer months is bound to have a bad effect on the extension of business in a place like Felixstowe. With such little success at 7d., it will be uphill work to increase the private business at 8d. And the reduction in winter—when there are no visitors in the town, and the householders will not care a snap for electricity for their own use—is hardly likely to give a fillip to the consumption then. Moreover, the charge for public lighting is to be lowered from 4½d. per unit to 3½d. We can see the Council pursuing their sad career by bolstering up the undertaking with public lighting in order to earn the 6 per cent. at the expense of the lighting rate. To proceed, it was also shown that the Company, on a capital expenditure of £10,000, were making a profit, in the various places they supply, about equal to 6 per cent. This being so, where on earth—not in Felixstowe—are the Company going to get the money from to pay 6 per cent. on £17,160 and the prospective increases of the capital? Even that is putting a better complexion on the position than it deserves; for, until this year, *the Company have never been able to pay more than 3 per cent.* From Felixstowe last year a gross profit of only £600 was made; and from this, depreciation and establishment charges amounting to £200 have to be deducted. What about the prospect of 6 per cent. on the £17,160? Including the water-rate, the rates in the town are equal to 8s. in the pound, improvements are expected to add another 6d., and now there is the present reckless proposal.

This is the story of the folly of the Felixstowe Town Council; and we cannot think the Local Government Board will permit such a monstrous piece of imprudence to be carried through. It is in towns like Felixstowe that the electricians are now trying to cultivate their business; and therefore it is hoped that this narrative of what is happening there will not be without some good effect—if not in the town itself, in places in which similar reckless schemes may be raised.

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BUILDING UP GAS BUSINESSES IN AMERICA.

By the mail from the United States at the end of last week, we received from Mr. Frederick H. Shelton, of Philadelphia, the supplement to a short article which appeared, under the above heading, in the "JOURNAL" for Oct. 1, 1901. That article was founded upon a very interesting compilation referring to a dozen and more gas companies which Mr. Shelton and a number of associates had purchased or started, and with which he was more or less responsibly connected. As was then shown, into the old or neglected works that had been taken in hand, new life had been infused, and a vigorous expansion of business had been the result. All the companies had at that time come under the new control within 28 months. Some of the works were previously in a wretched condition; and in others there was an indifference in regard to development, and consequently a stagnation of business. The new owners had put the works into a thoroughly good condition, and in some cases had rebuilt them. Following this came a vigorous pushing of the business; and a very liberal policy was adopted in the dealings of the owners with their customers.

Growth during the Last Two Years
Aug. 1, 1901, to Aug. 1, 1903.

Company.	Meters.		Output.	
	In Use, Aug. 1, 1903.	Gain per Cent.	Sales July, 1903.	Gain per Cent.
Jenkintown and Cheltenham	1,260	61	2,090,100	60
Philadelphia Suburban . .	9,540	378	17,992,100	348
Sunbury	765	61	882,000	73
Phœnix Gas and Electric—				
Consolidated Schuylkill Gas Co.	1,499	38½	2,110,900	22
Schuylkill Valley Illuminating Co.	1902. Receipts, $4,844·75		1903. $6,422·58	32½
(Monthly Average for Quarter ending Aug. 1.)				
Coatesville	854	28	1,167,400	14 9/10
Hanover	924	28	954,900	101
Petersburg	1,122	54	1,279,500 Average, per Month, for Three Months ending July 31.	103
Columbia	831	1	1,158,333	24
New Orleans	17,686	23	33,700,000	80
New York and Richmond .	4,988	60	10,814,000	109
Lynchburg Traction and Light Co. (Gas Department)	953	4 7/10	1,101,700	45

In the article published in 1901, we gave a table, showing the highly gratifying results that had ensued from the application of these methods; and now the figures for the two succeeding years (ending on Aug. 31 last) are available. Mr. Shelton's comments upon the figures are as follows: "Without exception the companies show continuous development, the percentages ranging from good to remarkable. In several cases earnings are now from 50 to 100 per cent. above interest charges. While surplus earnings have as yet mostly been put back into the plants, dividends have been begun; one Company declaring two in the past year. Others, in railroad parlance, 'are following closely,' and will probably pay dividends this coming year. In every case, bond interest payments have been paid, as due, with clockwork punctuality." Some of the figures are indeed remarkable; and Mr. Shelton and his colleagues may be heartily congratulated upon them.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The party opposed to differential prices for gas have prevailed in the Gas Committee of the Glasgow Corporation—at least, to the extent of preventing further differentiating. A year ago the differential rate was introduced; the price to ordinary consumers being fixed at 2s. 4d., and for power purposes at 2s. per 1000 cubic feet. The Gas Committee's proposition was to fix the price to ordinary consumers at 2s. 2d., and for power purposes at 1s. 10d. Their proposal, as was shown in the report of the Town Council meeting, given in last week's "JOURNAL," did not find favour, because of the difference between the two prices; and the report was sent back to the Committee. The Gas Committee took up the matter on Thursday, and, after considerable discussion, it was resolved to recommend that the price of gas to ordinary consumers be fixed at 2s. 1d. per 1000 cubic feet, and that the price for power purposes remain at 2s. Of course, this decision has to run the gauntlet of the Town Council, where it may be overturned at last, as it is not a unanimous decision of the Committee. There is a strong party who do not care to favour the users of gas for power. It is nothing to them that electricity may get hold of the market before the Gas Committee are able to bring down the price of gas so as to make it more profitable to use gas than electricity. The price of gas is steadily coming down, which makes it probable that in a few years the Corporation will be able to offer terms that will give gas the leading place; but if by that time electric plant has been installed, the Gas Committee will not find customers willing to throw out the one plant to take in the other. With this object in view, it might be the better policy for the Corporation to grant, for a few years, concessions to users of gas for power; making an effort to equalize prices as early as possible. But the Gas Committee have to face the situation that the electricians are a strong body in the Town Council, who have an enormous capital

TWO NEW PATENTS

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account upon which they require to earn as much revenue as possible. The actual positions in which the two undertakings stand financially are almost startling. The gas undertaking has a capital account of about £2,000,000; they have an annual revenue of £885,000; and a sinking fund of nearly £464,000. In the Electricity Department, they have, in the course of the ten years of its existence, run up a capital account of £1,087,000; they have an annual revenue of £127,000; and their sinking fund has not yet reached £50,000. Thus we find that for every £1 expended upon the gas undertaking, there is an annual return of 8s. 9d.; while the corresponding return in the Electricity Department is only 2s. 4d. The electricians are, as stated above, at the stage of casting their net. The haul is not yet quite satisfactory, even to themselves, as is evident from their further changes upon the method of charging. It would take too much space to detail their scale of charges. Their revenue was £127,000, and their expenditure £140,000. The Gas Committee could not afford to deal with their finances in this way. What is more, the Town Council would not allow them, as is evident by the doings of the last meeting of the Council. The reason why the Electricity Committee are allowed to handle their finances as they are doing is not, of course, because it is approved of as sound, but because of the exigencies of the situation, and the hope which is cherished of better times in store. These better times are to be procured by the artificial means of holding out marvellous inducements in their own department, and of blocking reasonable facilities to customers of the Corporation in another department. That is, if the resolution of the Gas Committee of Thursday is to be adopted, which I expect it will be, because of the power of the electricians upon the Council.

I observe a writer in the "Glasgow Herald" of yesterday—an ex-Town Councillor—applies himself to the matter of the price of gas. He writes at great length; but the gist of his argument is that, in his opinion, the best way to introduce differential rates for gas would be to charge winter consumers (say) 2s. 2d. per 1000 cubic feet, and summer consumers 1s. 6d. per 1000 cubic feet. The idea is a novel one, and, I am afraid, has little but novelty to recommend it.

The selection of the short leet for the post of Engineer and Manager of the Glasgow Corporation Gas Department (given in another part of the "JOURNAL" to-day) will occasion general surprise. Rumour has, of course, been busy with the situation, and names have been freely talked of, none of which appear on the list drawn up by the Sub-Committee. It has been reported that the applications number seventeen; and that among them are some of the most conspicuous men in the gas profession. If such applied, their applications have not been entertained. Can anyone furnish a reason for this, on the assumption that it is the case? I incline to think that some severe conditions have been laid down, as to age or something else, which have narrowed the circle, and that the gentlemen who have been selected are such as have their future before them, rather than those who have already made their name. Some colour is lent to this view by the desire of the Gas Committee to have six "recent" testimonials sent to them. They do not wish to have a man who has done his life-work, and is now ready to rest upon his laurels. They want one direct from the anvil; and in this view it is significant, too, that it is the anvil, and not the laboratory, they make their selection from. Academic acquisitions do not seem to have so much weight with the Sub-Committee as has business experience. From what they have disclosed of their hand, I think it is evident that what the Sub-Committee want is a man to manage the undertaking, and not either a figure-head or a man who might consider that he had done his duty if he should succeed in managing the Gas Committee.

The Gas and Electric Lighting Committee of the Aberdeen Town Council have resolved that the post of Engineer and Manager of their works shall be given to Mr. Samuel Milne, the Assistant-Manager. I presume the Council have to ratify the decision of the Committee, although it is given out that they have made the appointment. If ever a man deserved an appointment at the hands of a Corporation, it is Mr. Milne in Aberdeen. He has been practically Manager for a year or two; and it has been pleasant to see how loyally he always carried out the ideas of Mr. Smith, his senior. Taking an old head upon his young shoulders was the wisest course for him to follow, because he then had the benefit of Mr. Smith's long experience; and in his management of the works, he was thus able to conduct them in a way which was so highly successful that the Committee would scarcely have acted rightly towards Mr. Milne if they had passed him over in making the appointment. The view may be expressed that the situation ought to have been advertised, so as to have brought out the best man, and given others a chance of getting so desirable a position; but, in the special circumstances of the case, advertisement would only have led to disappointment, because Mr. Milne was in such a commanding position that he was almost certain to get the place.

The resignation of Mr. G. Keillor, jun., of the position of Manager of the Peterhead Corporation Gas-Works, on his appointment at Broughty Ferry, came before the Peterhead Town Council on the evening of Friday of last week. Provost Leach said that, while they regretted to lose Mr. Keillor at this time, they were glad that he had got a better appointment than they could give him. He had done good and faithful service at Peterhead. He had taken a step in the right direction; and he would no doubt yet rise higher in his profession. Mr. Ritchie, the Convener of the Gas Committee, said that Mr. Keillor had proved himself a capable and trustworthy servant indeed to the public. He had shown himself to be a capable Gas Manager in all respects, and to be well up in the practice of reducing scientific principles to pounds, shillings, and pence. He had given them good value for the salary he had received, and had the satisfaction of leaving the works in a much better condition in every respect than when he went to them. It was agreed to accept the resignation, and to advertise for a successor.

I am pleased to have a note from Mr. Keillor, stating that the terms of his appointment will not lead him into conflict with the Borough Surveyor—a contingency which I regarded as likely to arise from the resolution of the Council, which Mr. Keillor is good enough to say

Gas Heating Season 1903-4.

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was somewhat vaguely reported. The Borough Surveyor will annually check stocks for the Auditor; and in the matter of fabrics, he will act only in a consultative capacity, when asked. This is a very different appointment from that which I read in the report of the Town Council meeting; and it is most satisfactory to know that Mr. Keillor is not to be interfered with in any way whatever in the discharge of his duties.

The Falkirk Town Council had before them on Monday the estimates in connection with the Corporation Gas Department for the current year. They were submitted by Mr. Wilkie, who said that when the estimates were brought up a year ago it was considered that the reduction of 4d. per 1000 cubic feet, which was then made, would result in reducing the balance they had in hand by £300; but they found that, instead of a reduction, there had been an increase of the balance by more than £500, which spoke very much to the credit of their late Manager, Mr. Kincaid. In the estimates for the current year, they were providing for new benzol plant and apparatus, at a cost of £372, by means of which they would be able to keep up the illuminating power of the gas during the worst months of the winter. They proposed to take this amount out of revenue. He might bring under their notice that, owing to the increased profit-producing power of the gas-works, they were called upon to pay extra taxation to the burgh to the amount of £608, which was a great help to the burgh rates. The Committee were of opinion that they were quite in a position to take a further 2d. off the price of gas this year. The reduction would make their income less by about £1000, and, with the cost of the benzol installation, would require that £1372 should be made up. They were still setting aside 1½ per cent., instead of 1 per cent., to the sinking fund; and, for the second year in succession, they had contributed £1000 to the reserve fund. They estimated an increase of about £500 from residual products, and he believed they would save £100 upon coal. The estimates were adopted; and the price of gas was reduced as proposed—from 3s. to 2s. 10d. per 1000 cubic feet. The question of a site for the new gas-works is soon to be before the Council.

I have before mentioned the good work which Mr. H. O'Connor, of Edinburgh, is able to do in the class in the Heriot-Watt College in Edinburgh, in which he lectures upon gas manufacture and appliances. He has again started his course of tuition for the session. He lectures on Friday evenings. Two sessions are required for the study. In this, the first of the two, he deals with the manufacture of gas up to the outlet of the scrubbers, with the construction and working of the various pieces of apparatus up to this point, and with the necessary tests of the crude gases and coal. A very large number of the gas managers of Scotland have taken advantage of the opportunities for study offered in the College, and many of Mr. O'Connor's former students are now in good positions.

On Wednesday of this week, a deputation from the Manchester Corporation, consisting of Alderman Gibson, Chairman of the Gas Committee, and other members of the Committee, with Mr. J. G. Newbigging, the Gas Engineer, and Mr. F. A. Price, the Deputy-Superintendent, visited Edinburgh, and were shown over the Granton works by Mr. W. R. Herring and the Granton Works Committee of the Gas Committee.

Yesterday the Edinburgh and District Water Trustees held their annual inspection of the new Talla water augmentation scheme. A good deal of work has still to be done upon the great reservoir at Talla, of which 37 feet of a dam 124 feet in height have still to be built. It is estimated that quite two years yet will be required for the completion of the works. The inspection was this year confined to the work at the reservoir, where about 700 men are employed. At its conclusion, the party dined in a building which has been erected at the spot by the Trustees, and named "Victoria Lodge."

The Edinburgh and District Water Trust on Thursday imposed their rates for the year. Mr. Wood, of Portobello, the Convener of the Finance Committee, and the only original member of the Trust remaining in office, said that the mortgage debt of the Trust, exclusive of £102,900 of temporary loans, amounted to £1,398,613. They estimated an income of £111,539, and an expenditure of £124,627. There would thus be a deficit of £13,088. The Trustees have, however, a sum of £16,812 lying at the credit of revenue account; and, notwithstanding the deficit, they would be able to go on for another year without raising the rates. By another year, however, the charges in connection with the capital required for the Talla scheme would be so high that they would then require to face an increase. The rates were fixed at 5d. in the pound of a domestic rate, 1d. in the pound of a public rate, and 2d. in the pound of a shop rate.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 26.

Sulphate of Ammonia.

The market has continued firm during the week, and a fair amount of business has been transacted; values still showing a hardening tendency at the close. Quotations for prompt delivery are now £12 5s. per ton f.o.b. Hull, £12 7s. 6d. to £12 8s. 9d. per ton f.o.b. Liverpool, and £12 10s. per ton f.o.b. Leith. Colonial orders have again been in evidence, and the market has been further supported by the requirements of dealers who had September sales to cover. The labour troubles at the shale works in the North having entered upon a more acute stage, have accentuated the firmness. As regards forward, quotations in London for delivery up to the end of the year have been advanced to £12 12s. 6d., Beckton terms. For January-June, there are buyers at £12 10s. f.o.b. Leith, ordinary terms; but makers are holding for an advance.

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LONDON, *Sept.* 25.

Tar Products.

The markets generally remain in about the same position. There is certainly a very strong demand for benzol. There appears to be quite a scarcity of 90 per cent. for delivery in London, and 10d. is reported to have been paid in more than one instance for prompt delivery. In 50-90 per cent., contracts have been arranged at 7½d. for October-December delivery, principally for home consumption. Toluol and solvent continue dull, and there is really no business to report. Heavy naphthas are, however, still freely inquired for; and values are well maintained. In crude carbolic, business has been done at 1s. 6d. for delivery up to the end of the year—in fact, one London maker reports a large sale at a little over this price. Creosote continues firm. One or two large contracts have been placed during the past week at slightly improved values. As regards pitch, the demand for prompt delivery is very good, especially from South Wales, where consumers are short of stock. On the Continent, great stagnation prevails. Owing to the numerous offers made by speculative dealers for forward delivery, consumers will not contract; and probably no forward business will be arranged for some time to come. In tar, prices are certainly easier all round. Distillers do not care to contract at the figures recently mentioned; while the sliding-scale is coming more into fashion where the quantities contracted for are large.

The average values during the week were: Tar, 23s. 6d. to 31s. Pitch, London, 52s. 6d. to 53s.; east coast, 51s. 6d. to 52s.; west coast, 50s. to 50s. 6d. Benzol, 90 per cent., 9½d. to 9¾d.; 50-90 per cent., 7¼d. to 7½d. Toluol, 6¾d. Crude naphtha, 3d.; solvent naphtha, 7d. to 8d.; heavy naphtha, 9d. to 10d. Creosote, London, 1 7/16d. to 1½d.; North, 1¼d. Heavy oils, 2¼d. Light oil, 1⅜d. to 2¾d. Carbolic acid, 60 per cent., 1s. 6d. Refined naphthalene, £5 to £8; salts, 24s. to 26s. 6d. Anthracene, "A" quality, 1¾d. to 1⅞d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

There is a very firm market, and a strong demand for both prompt and forward delivery. The Gaslight and Coke Company are asking £12 12s. 6d. in any position, and are reported to have made sales at £12 10s. The South Metropolitan Company sold some quantity at £12 11s. 3d., and now ask £12 12s. 6d. in any position. In Hull, business has been done at £12 5s. for prompt and forward delivery. Makers now ask £12 6s. 3d. to £12 7s. 6d., and are offering only small quantities. In Liverpool, the market is very steady. Business has been done at £12 7s. 6d. As a rule, makers ask £12 10s. In Leith, the demand is very strong for both prompt and forward delivery. There is a rumour that as much as £12 10s. was actually paid for prompt delivery. The high prices now being realized at this port are probably caused by the fear of a strike which seems likely to occur, although at present nothing definite is settled respecting same. The market closes decidedly firmer; and prices have an upward tendency for both prompt and forward delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Little or no improvement can be reported in the coal trade of this district. Collieries, except here and there, are generally not running more than four days, and supplies of all descriptions of fuel continue plentiful on the market. With the close of the month, pit quotations remain about 13s. 6d. to 14s. 6d. per ton for best Wigan Arley, 11s. and 11s. 6d. to 12s. 6d. for seconds Arley and Pemberton four-feet, and common house-fire coals about 9s. 6d. to 10s. 6d. The lower descriptions of round coal still move off but indifferently; and, notwithstanding the continued restriction of output, the production is ample to meet consumption, with prices scarcely in all cases fully maintained at recent quotations. Some of the common sorts of steam and forge coals might be bought at from 7s. 9d. to 8s. per ton at the pit, good medium qualities ranging from 8s. 3d. to 8s. 6d., and the best descriptions not more than about 8s. 9d. Some of the better sorts of engine fuel are moving off fairly well; but the commoner qualities are offering in excess of demand, and, if anything, are here and there cut rather low to effect clearance sales. The best qualities of slack are quoted from 6s. 3d. up to 6s. 9d. per ton at the pit, medium sorts average from 5s. 3d. to 5s. 9d., with inferior slack readily obtainable at about 4s. to 4s. 3d. per ton, and some of the common sorts fetching 4s. 6d. to 4s. 9d. The shipping trade remains quiet, with steam coals delivered at the ports on the Mersey averaging 9s. 3d. to 9s. 6d., and some better qualities fetching 9s. 9d. to 10s. For coke, makers are very strong in holding to their full quotations, and there is a tendency to harden here and there on new contracts.

Northern Coal Trade.

There is a steady demand for coal, more especially for early delivery; and the collieries are working steadily. The forward demand is not so strong; and prices for delivery after a little time are decidedly easier. As to the steam coal trade, the best qualities are in fair demand, and business is pretty good. Best Northumbrian steam coals are from 10s. 9d. to 11s. per ton f.o.b., second-class steams are 9s. to 9s. 3d., and steam smalls are from 5s. 3d. to 5s. 6d. In the gas coal trade, there is a steady enlargement of the demand, which must go on for some months. Prices of Durham coals vary from 8s. 6d. to 9s. per ton f.o.b., according to quality; and though there are not now many contracts in course of arrangement, the general quotation under such as are in treaty seems to be from about 8s. 3d. to 8s. 9d. per ton f.o.b., according to the quality and the time of delivery. For export, gas coke is quoted up to 14s. 9d. per ton f.o.b. in the Tyne; while comparatively low prices are the rule at the inland gas-works.

Scotch Coal Trade.

The market has been steady and without change or outstanding feature. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 6d. to 9s. 9d., and splint 9s. 3d. to 9s. 6d. The ship-

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ments for the week amounted to 264,451 tons—an increase of 25,037 tons upon the previous week, and of 31,627 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 7,953,645 tons—an increase of 305,741 tons upon the same period of last year.

Brisbane Gas Company.—In the six months ending the 30th of June, the net amount carried to the profit and loss account by the Directors of this Company, including the outstanding balance, was £11,345; and at the half-yearly meeting, held on the 7th ult., a dividend of 5 per cent. was declared. The payment of this and a bonus of 6d. per share, with the dividend tax, absorbed £8085, and left £3260 to be carried forward.

Electric Lighting in Dublin.—The change from the old electric light system to the new, which has been in contemplation for some time past in Dublin, was successfully carried out on the 20th inst. The Consulting Engineer (Mr. Robert Hammond), the City Electrical Engineer (Mr. M. Ruddle), and a large staff were in attendance, supervising and assisting, both at the Pigeon House Fort and Fleet Street, while the work of transferring the city source of supply to the new station was being accomplished. At 11.45 a.m. this was completed, and soon after the various arc lamp circuits in the streets were switched on to the Pigeon House Station. The result was so satisfactory, that when the usual hour for lighting the lamps in the evening arrived, the whole of the 180 lamps were in connection. The formal opening of the new system is to take place next month.

Ilford Gas Company.—At the recent ordinary general meeting of this Company, the Chairman and Managing-Director (Mr. W. Ashmole), in moving the adoption of the report, congratulated the proprietors upon another successful half year. He said that it was, in point of fact, the most prosperous one they had ever had, as the balance-sheet not only showed an increase in the sale of gas of upwards of 29 per cent., but the profits were higher than they had ever been before, notwithstanding the efforts made by the Local Authority with the electric light. The satisfactory working of the Company's business was largely due to the efforts of Mr. Johnston, the new Manager, who had devoted himself with untiring energy to his work, and had introduced several economies and improvements, all tending, not only to saving, but to greater efficiency. He thought they might heartily congratulate themselves that they had obtained such a worthy successor to Mr. Brown. Mr. Farquhar, late of Edinburgh, had been appointed Assistant-Manager. Having given some particulars of the additions to the works in hand and contemplated, in order to meet the increased demand for gas, the Chairman announced the intention of the Directors to make a reduction of 2d. per 1000 cubic feet in the price at the end of the current year. The report was adopted, and dividends at the rates of 6 and 4½ per cent. per annum on the different classes of stock, free of income-tax, were declared.

Torquay Gas Company.—Presiding at the half-yearly meeting of the Torquay Gas Company on Wednesday last, Mr. W. H. Kitson, the Chairman, said the receipts for the six months ending June 30 amounted to £16,797, against £16,064 in the corresponding period of last year, and the expenditure to £13,264, compared with £12,634; showing a profit balance of £3533. The half-year's dividend would absorb £3466; leaving a surplus of £67. Referring to a proposal to lay down electric tramways, Mr. Kitson said the scheme would need to be carefully watched, as it might affect the gas-mains to a serious extent; and, if necessary, the Company would be obliged to oppose it at a heavy expense in order to maintain their rights and property. A resolution authorizing the payment of an interim dividend was carried.

Water Extensions at Cheltenham.—The Local Government Board have just given their sanction to a scheme for duplicating the water-main from the River Severn at Tewkesbury to Cheltenham. At first, the Board refused the loan; but the Town Council persisted in their application, with the result that they have now agreed to the proposal, subject to the condition that the Council accept all legal responsibility. This they had already consented to undertake, so that the way is clear for a commencement of the work. Up till some ten or twelve years ago, Cheltenham was, so far as the public service was concerned, supplied exclusively from the gathering grounds of the high levels at Hewletts, Leckhampton, and Dowdeswell; but a succession of dry seasons reduced the yield of the springs to such an alarming extent, that another source became essential. Fortunately, among the assets which the town took over from the Water Company was the right to abstract 4 million gallons a day from the Severn, and by this means the older source has been supplemented. The duplication of the main from the river will enable the Council, if necessary, to dispense altogether with the hill supply.

Driffield Gas Supply.—The progress of the gas undertaking of the Driffield Urban District Council in the year ending June 30 has just been recorded in a working statement issued by the Gas Manager (Mr. Ernest W. Wright). It shows that the coal carbonized amounted to 2594 tons, being an increase of 201 tons; and the gas produced reached a total of 26,102,000 cubic feet, or an increase of 1,219,000 cubic feet. The gas made per ton of coal carbonized was 10,062 cubic feet, compared with 10,402 cubic feet before. This was a drop of 340 cubic feet; but the gas actually sold per ton of coal was 129 cubic feet more. The leakage had been reduced by 3·57 per cent. The quantity of coke sold per ton of coal used was 6·62 cwt., compared with 6·47 cwt. in 1901-2. The tar produced was slightly less; but, on the other hand, the quantity of ammoniacal liquor was greater by 14,955 gallons gross, and showed an increase of 36 gallons per ton. Less purifying material had been used. The quantity of gas sold to private consumers reached a total of 21,408,100 cubic feet, compared with 19,422,400 cubic feet in 1902, or an increase of nearly 2,000,000 cubic feet; and 94,000 more cubic feet were used in the public lamps than in the preceding year. The total revenue was £5218, against £4638—an increase of £580.

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J. T. WESTCOTT, Manager.
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	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	25,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

The De Brouwer Coal Projector.—A complete coal handling plant, with a De Brouwer projector, is about to be established at the Nuneaton Gas-Works; the order having been placed with Messrs. W. J. Jenkins and Co., Limited, the sole makers of the De Brouwer plant in this country. The projector is to be fitted with a hopper and electric hoisting and travelling gear, to suit Mr. George Helps's arrangement of retorts. A contract has also been entered into for the supply of a projector and a discharging machine for the Nottingham Corporation Eastcroft Gas-Works.

Ipswich Gas Company's Staff.—Following upon a walking match last Saturday week, in which practically the whole of the staff of the Ipswich Gas Company engaged, the members were entertained at dinner at the Cornhill Restaurant; the Chairman (Mr. D. Ford Goddard, M.P.) presiding. He subsequently handed the prizes to the winners—the first eight men home—and also presented Mr. H. E. Boar with some tangible tokens of the staff's good wishes on the occasion of his approaching marriage. These the recipient suitably acknowledged.

Further Parliamentary Powers for Rotherham.—The Rotherham Corporation intend to promote in the next session of Parliament a Bill having for its object (among other things) the extension of the gas supply area so as to include populous places just outside the present limits. It is anticipated that an agreement will be come to with the Sheffield Company for the re-arrangement of the existing unsatisfactory and overlapping boundary for gas purposes between the Sheffield and Rotherham districts. Other powers are also to be acquired in regard to the Gas Department. It is not anticipated that the Bill will be opposed.

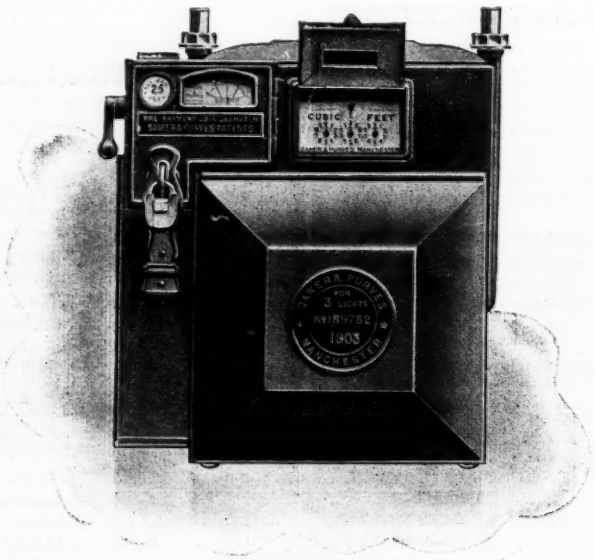
Good Advice and the Result.—It is a pleasure to be able to congratulate the Bridport Water Company upon the great improvement in the financial condition of their undertaking. Two years ago they were anything but flourishing; and they very wisely sought outside advice. Mr. W. A. M'Intosh Valon, C.E., was called in, and he examined into, and reported upon, the position. The recently issued report of the Directors shows that the affairs of the concern are now in much better form. The Board are able to congratulate the shareholders on their improved state; this being chiefly due to their having followed the advice given by Mr. Valon, who recommended them to carry out the full powers of their Act of 1892 respecting rates, which had never been previously done. The Company are not yet entirely out of the wood; but the Directors are confident of being able to maintain in the future the position they have arrived at. The Directors declare full dividend on the 5 and 4½ per cent. preference, and the 4 per cent. preferred ordinary shares; and they further say that they have pleasure in recommending—and it is the first time in the history of the Company that they have been in a position to do so—a dividend on the ordinary shares at the rate of 2½ per cent. per annum, free of income-tax, and carry forward a balance to the next half-year's account.

East London Water Company.—The accounts to be presented at the half-yearly general meeting of this Company on Thursday show that in the six months ending the 24th of June there was an increase in the revenue of £5402, and in the expenditure of £4631, compared with the corresponding period of 1902. The water-rates were higher by £4733. There were 3131 new services laid on, against 3060 before; bringing up the total to 223,633. The amount available for distribution is £70,101, compared with £89,995; and the Directors recommend a dividend at the rate of 8 per cent. per annum, less income-tax.

London Water Supply.—Sir W. Crookes, F.R.S., and Professor J. Dewar, reporting to the Official Water Examiner for the Metropolis (Mr. Charles Perrin, M.Inst.C.E.) on the composition and quality of daily samples of the water supplied to London last month, state that, of 216 main-derived samples chemically analyzed by them, "all were found to be clear, bright, and well filtered." Bacteriologically, samples of filtered and unfiltered water, numbering 730 altogether, were examined, with satisfactory results, having regard to the "entirely abnormal weather experienced during the present summer." At Oxford, the rainfall in August was 3·34 inches, against an average of 2·38 inches; the total excess for the year being 9·77 inches, or 6·23 per cent. above the average for a period of 35 years.

Visit to the Chester Gas-Works.—The summer excursions of the Chester Society of Natural Science concluded with a visit last Wednesday to the Chester Gas-Works. The party, consisting of between 70 and 80 members, including a number of ladies, assembled at the works at half-past three, and were conducted through them by the General Manager (Mr. F. A. Pye), the Engineer and Works Manager (Mr. J. C. Belton), and Mr. J. Bairstow, F.C.S. The entire process of gas manufacture, including the treatment of ammoniacal liquor, was fully explained. On the completion of the inspection of the works, the members assembled in the fitting stores room, where tea was served. Mr. Bairstow showed, by means of a chart and samples, the various products resulting from the distillation of coal tar, and displayed a variety of dyed silks and materials. Round the room the fitting staff exhibited the various forms of burners, ranging from the old-fashioned flat-flame to the incandescent burner; and ordinary and prepayment meters were shown. Before separating, the thanks of the members were accorded to the officials of the Company, on the proposition of the President of the Society (Rev. A.A. Fish, B.A., B.Sc.), who stated that he had been over various gas-works, but he did not think he had ever before heard the process of gas manufacture explained so lucidly. Mr. Belton had taken immense pains to make the visit interesting. Though many gas-works might be larger, they in Chester had every reason to be proud of theirs, which were admirably and economically worked by private enterprise. The public gained advantage from the extremely skilful, scientific, and economic management carried on at these works. These remarks were supported by Dr. Granger; and Mr. J. Gamon, Chairman of the Company, appropriately acknowledged them.

S&P



THE
"POSITIVE"
DRY
METER

According to the abstract of the accounts of the Barnsley Corporation for the year ending the 31st of March last, recently issued by the Borough Accountant (Mr. A. Newsum), the expenditure on the Midhope Water-Works of the Corporation in the twelve months amounted to £64,028; bringing up the total outlay thereon to £252,242.

The profits of the Broken Hill Water Supply Company for the half year to June 30 last were £13,396, and a sum of £16,107 was brought forward. Two dividends of 6d. per share have been paid, and £2000 transferred to the contingency reserve fund; leaving £17,000 to be carried forward. The Directors have offered the undertaking to the New South Wales Government for £220,000, or to carry out certain extensions, estimated to cost £25,000, on 4 per cent. interest being guaranteed.

One of the most remarked features of the Grocers' Exhibition at the Agricultural Hall last week was the exhibit of Messrs. Beaufoy, wine merchants, &c, of South Lambeth. The success of their display was in no small measure attributable to the fact that they had disposed, in suitable positions around the stand, four 700-candle power "Lucas" lights, supplied by Messrs. Moffats, Limited. We believe this was the only gas-lit exhibit; and comparisons between it and those electrically illuminated were all in favour of gas.

For some time past negotiations have been in progress for the adjustment of the differences existing in the tube trade. It is understood that the basis of an agreement has been arrived at, under which Stewarts and Lloyd's, Limited, will guarantee the dividend on the preference shares in the Wilson and Union Tube Company, Limited, and take a large—it may be a controlling—interest in the ordinary stock of that concern. The issued capital of the Company is £100,000 in 5 per cent. preference, and £70,000 in ordinary shares. No dividend has been paid on the preference shares for a couple of years.

The rainfall in the Elan Valley, in which the new water-works of the Birmingham Corporation are situated, up to the end of August was 52½ inches, which was 3 inches in excess of the total rainfall for the whole of the year 1902. The Craig Goch reservoir has been overflowing for the last three weeks. Locally the rainfall registered at Whitacre amounted to 19½ inches up to the end of August, which was about 0·5 inch less than in the same period of last year. This is a most extraordinary circumstance, considering the heavy rainfall throughout the country, and the complaints that so far the year has been about the wettest on record.

The first ordinary general meeting of the Yorkshire Electric Power Company was held at the Hotel Métropole, Leeds, last Tuesday—Mr. Arthur G. Lupton in the chair. It was announced that the Contractors were in possession of the land for the first power station at Thornhill, and that the erection of the buildings was being rapidly pushed on. Tenders had been accepted for a 6000-horse power generating plant, together with the necessary equipment for transmission and distribution. It was stated that the Company are now in a position to negotiate for the supply of power within a radius of ten miles of the first station; and it will be available in about ten months' time.

At the offices of Messrs. Armitage and Norton, of Huddersfield, on Wednesday, a meeting was held of the Hygienic Stove Company, in liquidation and in course of reconstruction. The scheme for the formation of the new Company provides that the whole of the assets of the old one should be transferred to the new, who will pay in cash to the Liquidator £2359 1s. 2d. From this, £307 10s. 3d. will be appropriated to pay preferential debts in full, £1751 10s. 11d. to pay creditors, and £300 will go towards liquidation and reconstruction expenses. The balances owing to each creditor will be satisfied by the allotment of shares in the new Company. The meeting approved the scheme.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS ENGINEER (South America). No. 4100
DRAUGHTSMAN AND CLERK. Cambridge Water Company. Oct. 13.
GAS-FITTERS. Birmingham Gas Department.
HANDY MAN. No. 4101.
INSPECTOR OF METERS AND STOVES, &c. Peterborough Gas-Works.
SERVICE LAYER. No. 4102.
STOKER (LEADING). Woodford Green Gas-Works.

Situations Wanted.

GAS-STOVE TRADE. No. 4091.
LECTURES ON GAS COOKING, &c. Madame Alting-Mees, London.
MAIN AND SERVICE LAYER. A. M. C., Smethwick.
SECRETARY AND MANAGER SMALL WORKS. No. 4096.
WORKING MANAGER OR ASSISTANT. Poole, Madeley.

Agent Wanted by French Company. No. 4094.

Plant for Sale.

METER (200-LIGHT). St. Margaret's Works, Dunfermline.

Plant Wanted.

GASHOLDER AND TANK. No. 4098.

Sales of Stocks and Shares.

BOURNEMOUTH GAS AND WATER COMPANY. Oct. 8.
GREAT YARMOUTH WATER-WORKS COMPANY. Oct 20.
HARROW AND STANMORE GAS COMPANY. Oct. 20.
NORMANTON GAS COMPANY. Oct. 8.
ROMFORD GAS COMPANY. Oct. 20.
SOUTHEND GAS COMPANY. Oct. 20.

Meeting of Company.

DANISH GAS COMPANY. London Office, Oct. 29. Two o'clock.

TENDERS FOR

Buildings and Chimney.

PEEBLES GAS DEPARTMENT. Tenders by Oct. 17.

Coke.

RAMSGATE GAS DEPARTMENT. Tenders by Oct. 12.

Excavations and Pipe Laying.

PEEBLES GAS DEPARTMENT. Tenders by Oct. 17.

Gasholder.

BARMOUTH GAS COMPANY. Tenders by Oct. 21.
HOLDERNESS GAS COMPANY. Tenders by Oct. 10.
PEEBLES GAS DEPARTMENT. Tenders by Oct. 17.

Gasholder Tank.

HOLDERNESS GAS COMPANY. Tenders by Oct. 10.

Oil for Gas-Making.

MANCHESTER GAS DEPARTMENT. Tenders by Oct. 8.

Pipes.

PEEBLES GAS DEPARTMENT. Tenders by Oct. 17.

Railway (Overhead).

PEEBLES GAS DEPARTMENT. Tenders by Oct. 17.

Tank (Cast-Iron) and Corrugated Roofs.

PEEBLES GAS DEPARTMENT. Tenders by Oct. 17.

Tar and Liquor.

NORTHWICH GAS COMPANY. Tenders by Oct 9.
SCARBOROUGH GAS COMPANY. Tenders by Oct. 17.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered, either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

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(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL,
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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

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VICTORIA PAINT WORKS,
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
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Can be Exchanged for Spent Oxide.
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H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
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SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
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MADAME ALTING-MEES, Diplomée Paris, Londres, Bruxelles, "LECTURER ON GAS COOKING," is now booking dates for Lectures on the Continent and at home. Would accept a suitable permanent post as Demonstrator.
Write for terms for Lectures and Price of Pamphlet, "La Cuisine au Gaz," to Madame ALTING-MEES, 102, Sinclair Road, Kensington, LONDON, W.

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PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

ADVERTISER seeks an Appointment at a Gas-Works in Liverpool or Neighbourhood. Present situation, Secretary and Manager of a small Works—8 millions.
Address No. 4096, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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ADVERTISER (Age 36), 20 Years' first-class Experience in the Trade—Commercial and Manufacturing—is open to an ENGAGEMENT. Smart, energetic, good organizer, and thoroughly understands control of business.
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WANTED by a Young Man, a Situation as WORKING MANAGER in a Small Works, or as an ASSISTANT. Has had Ten Years' Experience in the routine of Gas-Works. Can lay Mains, Fix Meters, and do all Repairs. Age 24. Abstainer. Good References.
Address GEORGE POOLE, Gas-Works, Madeley, SALOP.

CAMBRIDGE UNIVERSITY AND TOWN WATER-WORKS COMPANY.

WANTED, a Draughtsman and Clerk.
Apply, stating Salary required, Age, previous Experience, and enclosing Two Original Testimonials as to Ability and Character, on or before the 13th of October next.

WM. W. GRAY,
Engineer and Manager.

4, Benet Street, Cambridge,
Sept. 25, 1903.

SITUATION Wanted by a Young Man as MAIN and SERVICE LAYER, with general knowledge of Fitting, or as Assistant to Superintendent. Five-and-a-half years with last employer. Age 24.
Address A. M. C., 17, Downing Street, Smethwick, BIRMINGHAM.

GOOD Leading Stoker Wanted. Wages 35s. per week. One day off fortnightly; seven days in summer with full pay.
Apply to the MANAGER, Gas-Works, WOODFORD GREEN.

WANTED, a smart Young Man as INSPECTOR of Meters, Stoves, and Burners.
State Experience and Wages required, also References (no Testimonials), to the MANAGER, Gas-Works, PETERBOROUGH.

WANTED, by Suburban Gas Company, a good and reliable MAIN and SERVICE LAYER.
Apply, by letter, stating Wages required, enclosing *copies* of Two Testimonials, to No. 4102, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGINEER Required to take charge of the Manufacture and Distribution of an important Gas-Works in South America. Must be thoroughly competent, and not exceeding 40 years of age.
Apply, stating Experience, to No. 4100, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for medium-sized Gas-Works near Birmingham, a Handy Man to repair Tools and Machinery. Wages 7d. per hour. Preference given to a Practical Mechanic who has held similar appointment.
Apply, enclosing *copies* of Testimonials, to No. 4101, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF BIRMINGHAM.
(GAS DEPARTMENT.)

GAS-FITTERS WANTED.

APPLICANTS, under 40 years of age, must be fully qualified, used to fixing Wet Meters, and accustomed to all classes of Compo. and Iron pipe work, Stoves and Chandelier fixing. Sample Meter Joints must be made by Applicants prior to engagement. Permanent employment for suitable men. Wages 8d. per hour, rising to 8½d. at the end of Three Months if work and conduct are satisfactory.
Apply, with *copies* of Two recent Testimonials, to GAS-FITTINGS DEPARTMENT, Council House, BIRMINGHAM.

A HIGH-CLASS French Company, whose Head Offices are in PARIS and who have been engaged for more than 30 Years in the Manufacture of Patented Apparatus of the greatest importance for all Water-Works, desires to find in England an ENGLISH AGENT (who would be paid by Salary and by a Share in the profits) possessing the necessary technical and commercial qualification to introduce and sell their Appliances to Water-Works in the United Kingdom.
Applications, by letter, accompanied by Testimonials and Applicant's Photograph, with the fullest Particulars as to his past Experience and learning (degrees obtained), and previous Occupation—should be addressed to No. 4094, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a second-hand Gasholder and STEEL TANK, between 40 feet and 50 feet diameter.
Particulars to No. 4098, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

ONE 200-Light Gas-Meter, second-hand, with Stop-Valve. Makers, W. & B. Cowan, Ltd.
Apply ST. MARGARET'S WORKS, DUNFERMLINE.

TO BE SOLD—Gas Valves (Six Screw) by Walker, 16 in. diameter; also Six RACK and PINION, by Donkin, same size. Equal to new.
GASHOLDER, 22 feet by 10 feet, with Steel Tank. Self contained.
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J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SCARBOROUGH GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the Scarborough Gas Company invite TENDERS for the surplus TAR to be produced at their Works for One or more Years from the 1st day of January next.
Particulars may be obtained on application to the undersigned.
Sealed Tenders must be delivered not later than noon on Saturday, the 17th day of October next, endorsed "Tender for Tar," and addressed to the Chairman, Gas Offices, 32, Westborough, Scarborough.

By order of the Board,
ALEXANDER ALLAN,
Engineer and Secretary.

Gas Offices, 32, Westborough,
Scarborough, Sept. 21, 1903.

BARMOUTH GAS COMPANY, LIMITED.

TENDERS are invited for the Construc-tion and Erection of a TELESCOPIC (Gadd and Mason) GASHOLDER (outer lift 38 feet diameter, inner lift 36 feet diameter, 14 ft. 6 in. deep) for the above Company.
Plans and Specification may be seen at the Gas-Works, Barmouth, or at the Office of the Company's Engineer, Mr. W. Belton, Gas-Works, Shrewsbury, from whom any further Information may be obtained, and to whom Tenders must be delivered not later than Oct. 21, 1903.

RAMSGATE CORPORATION.
(GAS DEPARTMENT.)

THE Committee invite Tenders for the purchase of their surplus COKE from the 1st of October, 1903, to the 30th of September, 1904. Probable quantity, 2000 to 3000 Tons, delivered free on rail or free into barge Ramsgate; purchaser paying dues.
Tenders to be sent in not later than Ten a.m. on Monday, Oct. 12, 1903, addressed to the Chairman of the Gas Committee, Boundary Road, Ramsgate, and endorsed "Tender for Coke."
The Committee do not bind themselves to accept the highest or any Tender.

T. N. RITSON,
Engineer.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the surplus TAR produced at these Works during the Year ending Sept. 30, 1904.
Coal carbonized about 6000 Tons.
Any further Particulars requested can be had on application to the undersigned.
Tenders, endorsed "Tar," and addressed to the Chairman, must be delivered here not later than Ten a.m. on Friday, Oct. 9, 1903.

S. S. MELLOR,
Manager and Secretary.

Gas-Works, Northwich,
Sept. 22, 1903.

HOLDERNESS GAS COMPANY.
(WITHERNSEA GAS.)

CONTRACT NO. 2.

THE Directors of the Holderness Gas Company invite TENDERS for the Construction of a Brick and Puddle TANK and Telescopic GASHOLDER on the site of their new Works at Withernsea.
Drawings may be seen, and Particulars obtained, at the Offices of the Company, Winchester House, 135, High Street, Hull, or on application to the Engineer, Mr. J. Holliday, Gas Offices, St. Mark's Street, Hull, on and after Tuesday, Sept. 29, 1903.
The Directors do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed "Tender for Gasholder and Tank, Withernsea Gas," must be delivered not later than noon on Saturday, the 10th of October, 1903, addressed to the undersigned.

HY. COOPER,
Secretary.

Winchester House, 135, High Street,
Hull, Sept. 21, 1903.

ROYAL BURGH OF PEEBLES.

NEW GAS-WORKS.

THE Town Council are prepared to re-ceive TENDERS for the execution of all or any of the following WORKS in connection with the erection of new Gas-Works at Eshiels, near Peebles:
1.—EXCAVATIONS.
2.—CONCRETE WORK.
3.—BRICK BUILDINGS.
4.—CHIMNEY STALK.
5.—CORRUGATED ROOFS, OVERHEAD RAILWAY, CAST-IRON TANK, &c.
6.—CAST-IRON PIPES.
7.—PIPE TRACK AND PIPE LAYING.
8.—GASHOLDER.
Plans, Specifications, and General Conditions of the several contracts may be obtained from the Subscriber on payment of £2 2s., which will be returned upon a *bona-fide* Tender being sent in by the applicant.
The Town Council do not bind themselves to accept the lowest or any Tender for any of the Works.
Tenders to be made to the Subscriber not later than Saturday, the 17th of October, 1903.

WM. BUCHAN,
Town Clerk.

Town Clerk's Office, Peebles.
Sept. 22, 1903.

IMPORTANT TO INVESTORS.

NORMANTON GAS COMPANY.

SALE OF NEW GAS STOCK.

THE Directors of the Normanton Gas Company have instructed
Messrs. BEAUMONT AND GLOVER
To SELL BY AUCTION, on Thursday, Oct. 8, next, at 5.45 p.m., at the Offices of the Gas Company, Normanton,

£3000 OF NEW ADDITIONAL STOCK,

Ranking for a Standard Dividend of 7 per cent. per annum.
The Stock will be sold in 30 lots of £100 each, and the purchase money will be payable as follows:

10 per cent. on the 8th of October, 1903.
40 " " 1st of November, 1903.
50 " " 1st of January, 1904.

Full Particulars and Conditions of Sale may be had from the AUCTIONEERS, King Street, WAKEFIELD, or from the undersigned,

EDWIN H. HUDSON,
Secretary and Manager.

Gas Offices, Normanton,
Sept. 24, 1903.

MANCHESTER CORPORATION GAS-WORKS.

TO OIL IMPORTERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the supply of OIL, for the Manufacture of Carburetted Water Gas. The Oil to have a flashing point of not less than 73° (Abel's test), and not less than any higher degree of temperature which may be specified in any future Act of Parliament or regulations to be made thereunder.

Full description, with analysis of the Oil offered, must be submitted with each Tender, as well as a sealed sample of the same.

The quantity of Oil, to be delivered free of all charges (including Ship Canal dues) into the Storage Tanks of the Corporation, at Trafford Wharf, on the Banks of the Manchester Ship Canal, in such quantities as may be from time to time required by the Gas Committee, will be 10/15,000 Tons during the Twelve Months ending the 30th of June, 1905. Tenders to be at a price per imperial gallon.

Further Particulars may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent of the Gas Department.

Sealed Tenders and Samples, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Oil," must be delivered at the Office of the Superintendent of the Gas Department, Town Hall, Manchester, on or before Thursday, the 8th of October, 1903.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Sept. 25, 1903.

DANISH GAS COMPANY.

NOTICE is Hereby Given, that the FORTY-NINTH ANNUAL ORDINARY GENERAL MEETING of this Company will be held at the Offices of the Company, 13, Victoria Street, Westminster, on Thursday, the 29th day of October next at Two o'clock, for the following purposes, viz.:—

1.—To receive the Report of the Directors and the Accounts for the Year ended the 30th of June, 1903.
2.—To declare a Dividend.
3.—To consider the re-election of the Directors retiring by rotation.
4.—To elect Auditors for the ensuing Year.

By order of the Board.
H. G. WARREN,
London Agent.

13, Victoria Street, Westminster, S.W.,
Sept. 23, 1903.

BOURNEMOUTH GAS AND WATER COMPANY.

ISSUE OF £10 SEVEN PER CENT. "B" SHARES.
MINIMUM PRICE OF ISSUE, £15 PER SHARE.

SALE by TENDER of 1000 £10 SEVEN PER CENT. "B" SHARES, in pursuance of the provisions of the Bournemouth Gas and Water Act, 1896.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL by TENDER 1000 "B" SHARES, of £10 each (the Dividend on which is limited to £7 Per Cent.), to be paid up in full on or before the 31st of December, 1903.

Particulars and Conditions of Tender may be obtained at the Company's Offices, Bournemouth, or of the Secretary, as under.

Sealed Tenders must be sent to the Secretary not later than Eleven o'clock on Thursday morning, the 8th of October, 1903.

By order,
WILLIAM CASH,
Secretary.

London: 90, Cannon Street, E.C.
Sept. 16, 1903.

BOOKS AND LEAFLETS

TO BE OBTAINED OF

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

THE FLOW OF GASES AND PROPORTIONING GAS-MAINS.—By F. SOUTHWELL CRIPPS, Assoc. M.Inst.C.E. *Price 7s. 6d.*

REPORTS OF DISTRICT ASSOCIATIONS OF GAS ENGINEERS AND MANAGERS FOR 1902. *Price 5s. 6d.*

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ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £13,200 NEW ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ROMFORD GAS AND COKE COMPANY, LIMITED.

NEW ISSUE OF 650 £5 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 20, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY.

NEW ISSUE OF 300 £10 "C" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 20, at Two o'clock precisely, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GREAT YARMOUTH WATER-WORKS COMPANY.

SALE BY AUCTION OF 500 £10 ORDINARY SHARES,

Ranking for 7 per cent. Dividend, 4 per cent. having been paid on similar Shares in the Company for seven years past. The Company was incorporated fifty years ago, for supplying the important seaport town of Great Yarmouth and its surrounding districts; and to keep pace with the increasing demand for water, this further capital for the construction of new works is required.

The Water-Revenue has risen from £14,256 in 1897 to £18,198 last Year.

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Particulars of Sale, with Form of Instructions for the Auctioneer or Secretary to purchase for Investers unable to attend the Auction, obtainable post free of the Secretary of the Company, Great Yarmouth, or of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

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Rich in Illuminating Power and Yield of Gas.
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Maintains a High Standard in Residuals.

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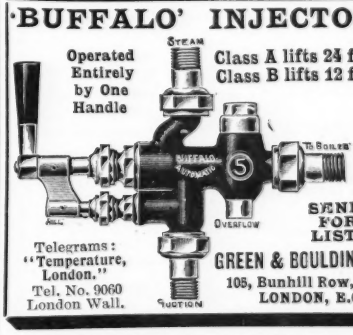

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Published Weekly

THE LUCAS LIGHT RECORDER

Issued in the interests of the Gas Industry and the finest high-power Gas Lamp known

Price 0d.

No. 11.] [*Tuesday, September 29, 1903.*

Salvo Pudore.

It is understood that dark or dimly lighted streets are favoured only by two classes of the community—rogues and lovers. There is no generally accepted way of looking upon the latter and their sombre propensities, nor can they claim to be consulted in this matter, being rarely found among the respectable class of ratepayers. As to the rogues, these form a category which, we are all agreed, should be diminished with all possible speed. For this reason, as also because normally developed ratepayers prefer light to darkness, the local duty in the matter of illumination is clearly marked out.

Struggling communities—and which administration does not have its work cut out to make both ends meet?—should try to find out whether the advent of the Lucas Light has not added a fresh element to their considerations. There is not much to say for the Light, and it might be considered immodesty on the part of its friends to call attention to its existence in such a connection. The only facts in its favour are these: It is a splendid light, softer and more diffusive than ever met before in high-power gas lighting (not to talk about electricity), and you get more of it for less money than is obtainable by any other system of artificial illumination. And the advance upon older methods is not a mere cipher—it is considerable, and may mean a difference of hundreds of pounds in your last estimate.

Does the suggestion of having your street lighted by a line of 200 c.p. lamps, with 700 or 1000 c.p. lamps at crossings and on more important routes, sound so unreasonable? The 200 c.p. will cost as much as a flat-flame burner to-day! If you care to work out the problem, MOFFAT'S LTD., of 155, Farringdon Road, E.C., will be happy to help you.

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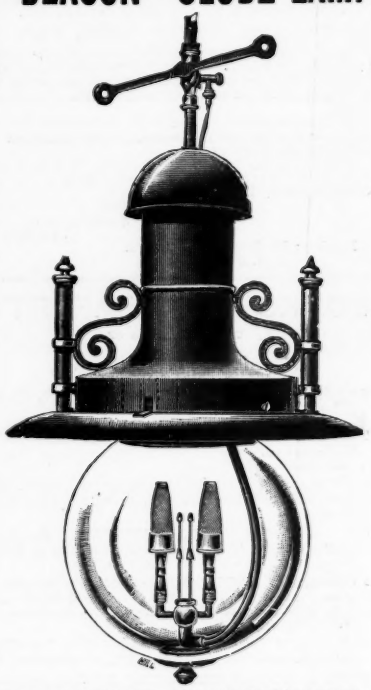
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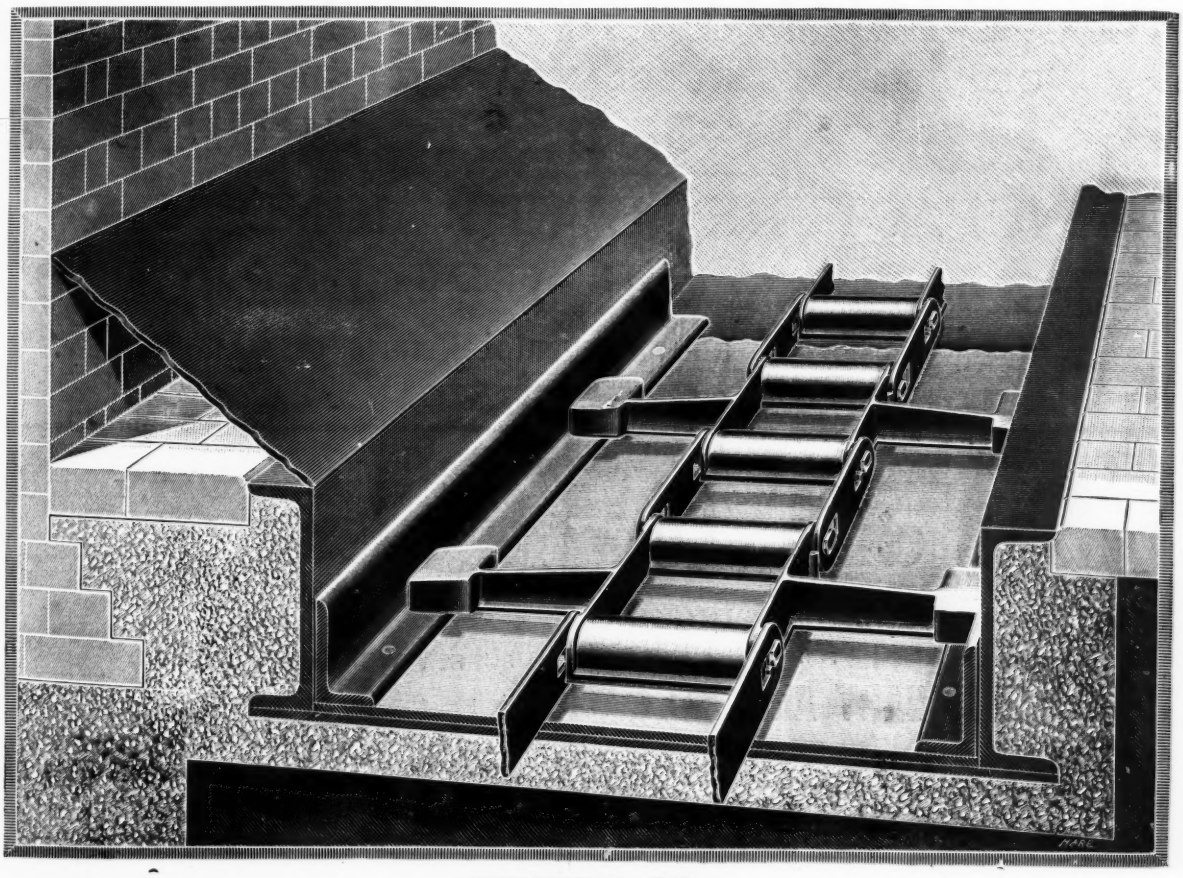

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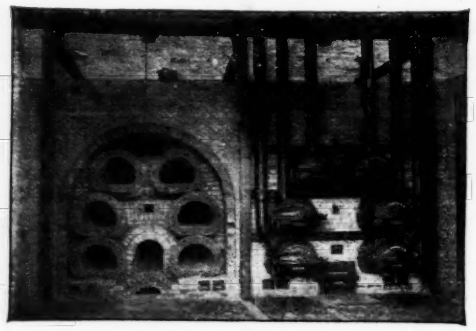

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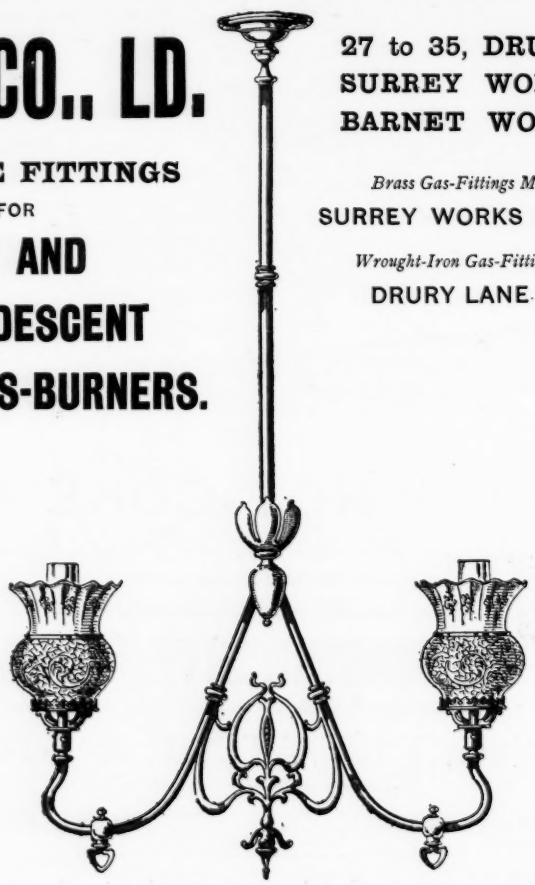

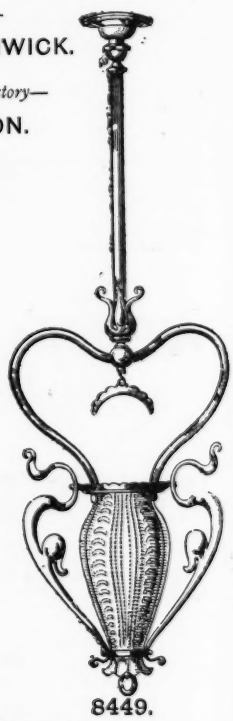

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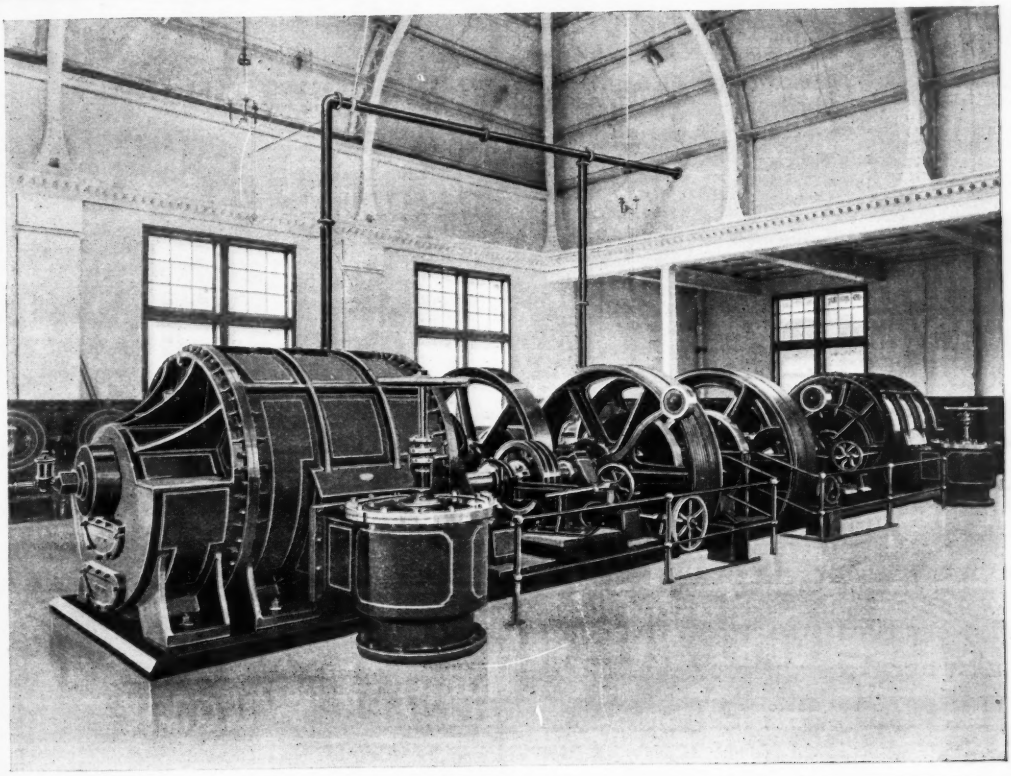

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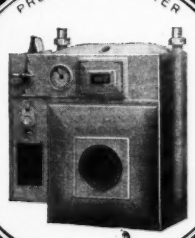
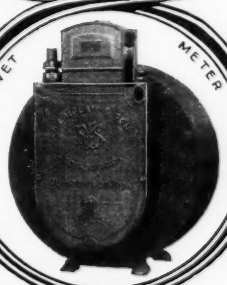
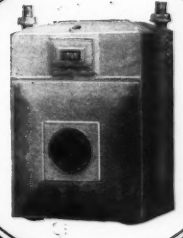


WET METER



DRY METER



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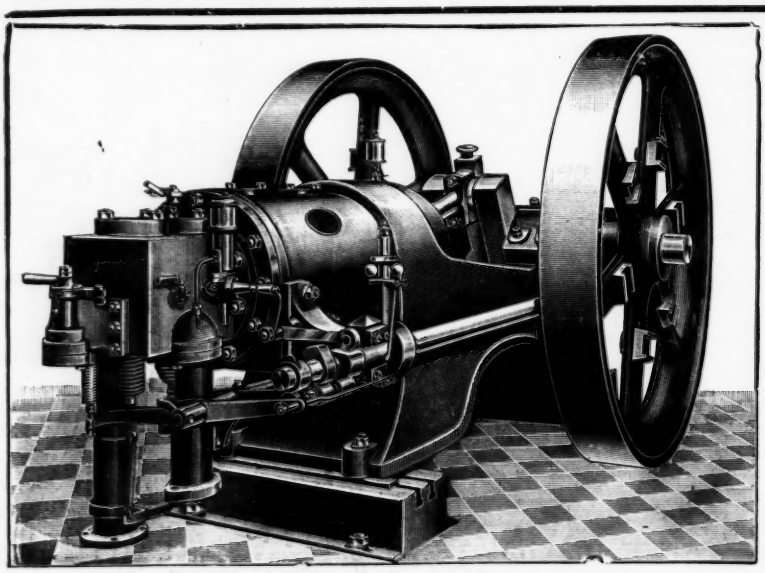

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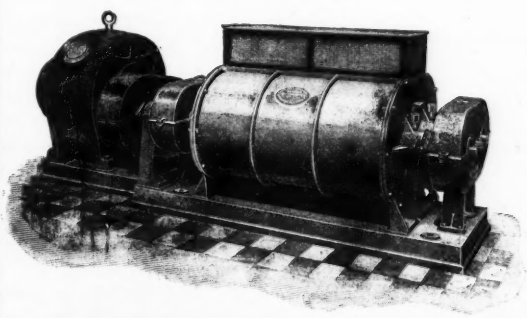

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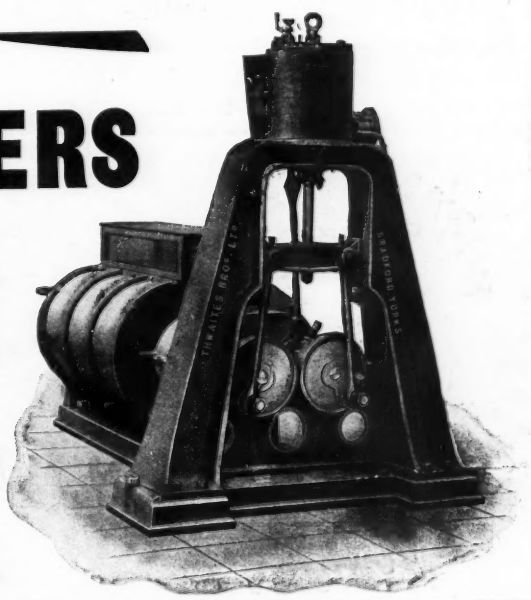

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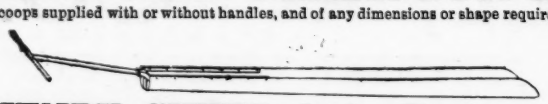

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Barcelona	14	126	Lübeck	4	36
Basel	11	99	Lynn (U.S.A.)	5	45
Berlin II.	14	126	Malaga	6	54
Berlin III.	15	135	Malmoe	12	108
Berlin IV.	24	216	Mariendorf, Berlin, I. C. G. A.	32	288
Berlin V. (Schmargendorf)	20	180	Mannheim	6	54
Berlin, I. C. G. A.	46	414	Mainz (Maintz)	7	63
Bielefeld	8	72	Muelhausen i. Els.	10	90
Bockenheim, near Frankfort	29	261	Muehlhausen i. Th.	4	36
Bremen	30	270	Mailand (Milan)	24	216
Brooklyn (U.S.A.)	5	45	München-Gladbach (Munich)	8	72
Brüssel (Brussels)	8	72	Pest (Pesth)	15	145
Cassel	17	153	Pest Mineralölfabrik	1	3
Central Union Gaslight Co., New York	6	54	Posen	6	54
Charlottenburg	32	288	Plauen i. Voigtl	6	54
Chemnitz	27	243	Odense	9	72
Coblenz	13	117	Randers	4	36
Darmstadt	12	108	Remscheid	3	27
Danzig	20	180	Rostock	6	54
Dresden II.	14	126	Rixdorf	12	108
Dresden III.	10	90	Stettin	21	189
Drontheim	2	18	Stockholm	24	216
Düsseldorf	8	72	Strandvej	4	36
Esslingen	3	27	Trieste	18	162
Elberfeld	5	45	Winterthur	8	72
Frederiksberg	27	233	Witten	4	36
Flensburg	6	54	Wittkowitz	4	31
Gera	9	81	Wien (Vienna)	186	1674
Genf	7	63	Zürich	32	288
Göttingen	10	90	Berlin-Tegel	40	360
E. & J. Gutmann, Wien	2	6	Nürnberg	32	288
Haag (The Hague)	9	81	Plymouth	8	72
Haarlem	12	108	St. Gallen	6	54
Hamburg, Billwärder	24	216	Enschede	8	72
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THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

[REGISTERED AS A NEWSPAPER.

VOL. LXXXIII. No. 2107.] LONDON, SEPTEMBER 29, 1903. [55TH YEAR. PRICE 6d.

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See Advertisement on p. 790.
Cowan Branch: LONDON, MANCHESTER, EDINBURGH, & SYDNEY, N.S.W.
See Advertisement on Third Page of Wrapper.

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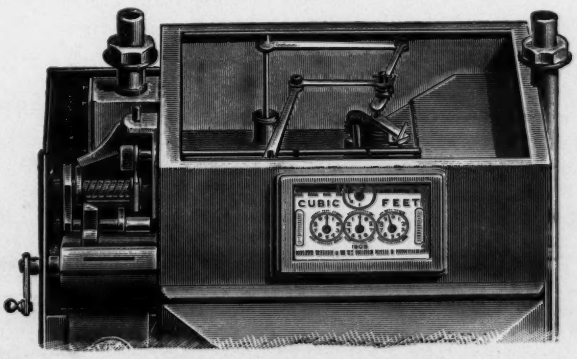

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FOR

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Full Particulars may be obtained from the Sole Makers,

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[See Illustrated Advertisement, Sept. 1, p. 592.]

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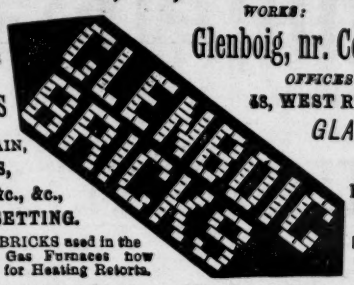

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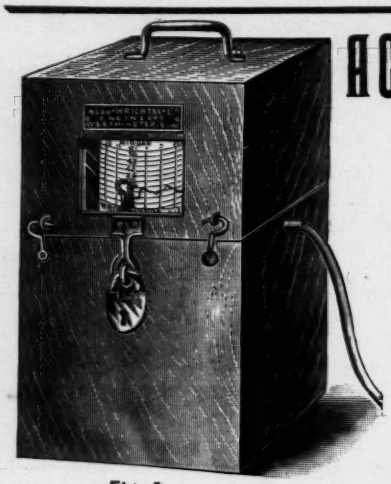

Fig. 1.

A COMBINED Portable (Fig. 1.) Works (Fig. 2.) REGISTER

To show 6 in. pressure, or 3 in. ex. and 3 in. pressure.

HUNDREDS IN DAILY USE.

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Fig. 2.

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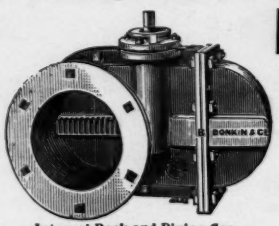
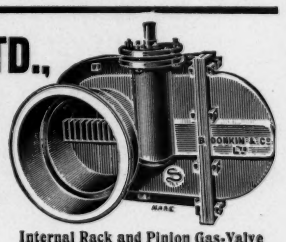
INTERNAL RACK AND PINION GAS-VALVE IN 1847



Internal Rack and Pinion Gas-Valve (Flange).



Internal Rack and Pinion Gas-Valve (Spigot and Socket).

Large Stocks kept
Prompt delivery

Over 100,000 now supplied.

All tested to 30-lbs. pressure Pinions of forged Steel.

Rack and Pinion Gas-Cock.

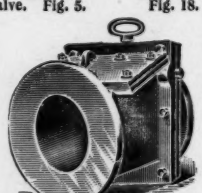
Teeth cut out of the solid. All Valves fitted with Patent Volute Springs.

Outside Rack and Pinion Gas-Valve. Fig. 5.

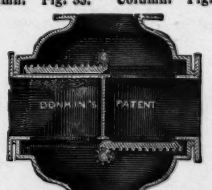
Outside Screw Gas-Valve. Fig. 18.

Internal Worm and Rack Valve and Column. Fig. 33.

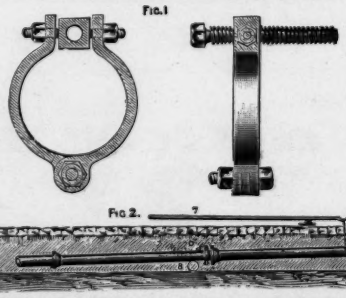
Internal Rack and Pinion Valve and Column. Fig. 20.



Self-Acting Bye-Pass.

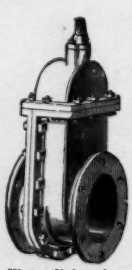


Four-Way Valve for Meters, Governors, Purifiers, &c.

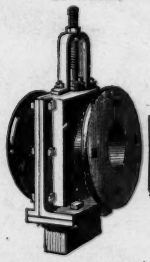


HELPS' PATENT PIPE-EXTRACTOR.

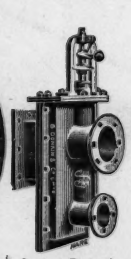
Worm and Rack Valve. Fig. 26. C.19c.



Water-Valve, for 200-lbs. pressure.



Hydraulic Main Seal Regulating Valve. Fig. 24.



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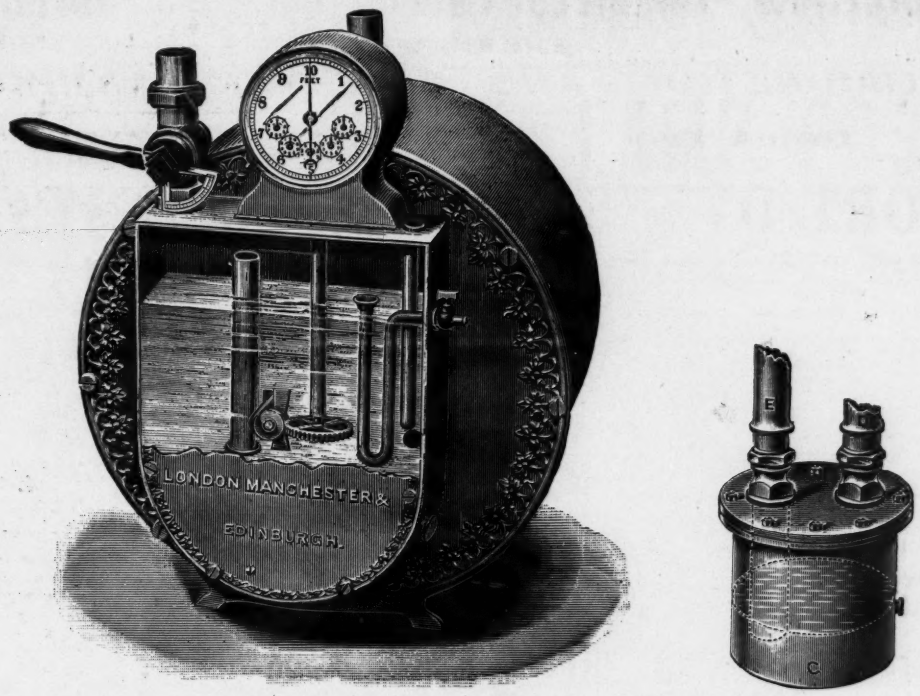

Air-Meter in Cast-Iron Case, with Regulating Cock and Hydraulic Seal Box.

IT is now generally agreed that the use of oxygen, either with or without the diluent nitrogen, is indispensable for the complete and economical purification of coal gas with either oxide of iron or lime.

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All that is necessary is to connect a suitable Air-Meter to the foul main on the retort side of the exhauster, through which the air is drawn and measured; and thus the required percentage can be regulated with great exactitude.

The above illustration shows a Meter specially designed for the purpose. The case is cast iron; the drum and spout being of tinned copper.

A cock, with pointer and quadrant, is provided, so that the necessary adjustment can be readily made. This is easily done (the make of gas being known, and the desired percentage of air being determined upon) by a minute's observation of the large index dial.

To prevent the foul gas from coming back upon the Meter, a Hydraulic Trap is used, as per illustration. The pressure in the pipe **D** presses the water in the Hydraulic Trap **C** up the Meter Outlet-Pipe **E**, thereby sealing the outlet of the Meter.

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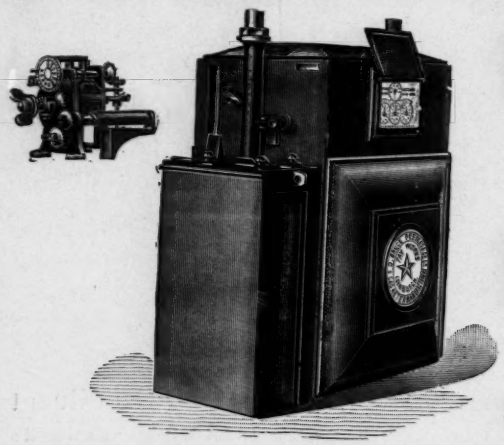

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